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[OFFICIAL NOTICE.]

New England Association of Gas Engineers.

SECRETARY'S OFFICE, BIRMINGHAM, CONN., Jan. 30, 1890.

The Twentieth Annual Meeting of the New England Association of Gas Engineers will be held at Young's Hotel, Boston, on Wednesday and Thursday, Feb. 19th and 20th. The meeting will be called to order by the President, Mr. Robert B. Taber, on the 19th inst., at 10 o'clock A.M. It can now be definitely stated that the following papers will be read sometime during the meeting:

"Vaporization and Feed of Oil to Generator or Retort," by Dr. Robt. Amory, of Brookline, Mass.

"Management of Small Gas and Electric Light Plant," by S. J. Fowler, of Westfield, Mass.

"A Point or Two in Regard to Illuminants During Condensation and Purification," by George F. Goodno, of Dedham, Mass.

"Notes on Revivification of Oxide," by Waldo A. Learned, of Newton, Mass.

"Various Methods of Introducing Gas Stoves," by H. A. Norton, of Boston, Mass.

"A Few of the Advantages of Water Gas over Coal Gas for Small Works," by F. H. Parker, of Burlington, Vt.

"Why I Shall Make Water Gas," by A. B. Slater, of Providence, R. I.

"A Chapter of Don'ts," by W. H. Snow, of Holyoke, Mass.

"Some Notes Taken in a Small Gas Works," by Ralph Woodward, of Waltham, Mass.

"Problems Constantly before the Gas Manager," by E. H. Yorke, of Brockton, Mass.

In addition to the above there are partially promised several other papers. I think all the members who see this notice will agree that, judging by the above list, the coming meeting bids fair to be a greater success than any of the meetings which have been held in previous years. The topics are quite varied, and many of the subjects are among the most important that gas managers have to deal with at the present time.

The officers of the Association believe that no member of the Association, and no one connected with the active business management of any gas company in New England, can afford to be absent from this meeting. Persons eligible for membership and desiring to join the Association will please apply at once to the Secretary, who will forward them blank applications. Although the membership is large, there are still a good many persons connected with the gas business through New England who do not belong to the Association. It is hoped that all such persons will see fit to join at the coming meeting, and make the Association what it ought to be, truly representative of the gas interest in the New England States.

CHARLES H. NETTLETON, Sec'y.

[OFFICIAL NOTICE.]

Ohio Gas Light Association.

OFFICE OF SECRETARY,
COLUMBUS, O., January 20, 1890.

To Members of the Ohio Gas Light Association:

Gentlemen—The Sixth Annual Meeting of this Association will be held at Toledo, O., on March 19 and 20, 1890.

This announcement is made thus early in order that all members may be reminded of the meeting in ample time to make their arrangements to be present. Every member is urged not only to attend this meeting, but also to interest himself in inducing others of his acquaintance who are eligible for membership, but who have not as yet joined the Association, to come to the meeting and become members.

It is not intended that as many papers as usual shall be presented at the forthcoming meeting, in order that more time than formerly may be had for the discussion of those that are read, and for such other matters and business as the members may desire to dwell upon.

Although the Secretary has for some time been engaged in the work

of soliciting papers for this meeting, he has not yet secured as many as should be had, notwithstanding fewer are desired than heretofore, and he therefore earnestly calls upon all members who can possibly do so to notify him immediately of their willingness to furnish papers.

It has been decided that an interesting and valuable feature of our meeting would be a "Question Box," in which members can place questions, which will be withdrawn and read to the meeting and answered and discussed by the members. Every member is requested to send to the Secretary at once any question or questions which he would like to have thus brought before the meeting.

Future circulars will announce further details concerning the meeting.

Respectfully, IRVIN BUTTERWORTH, Sec'y.

BRIEFLY TOLD.

MR. HALLETT'S SUCCESS AT SPRINGFIELD, MASS.—Our last issue for January contained a paper, read by Mr. J. L. Hallett, of the Springfield (Mass.) Gas Light Company, entitled "Looking Backward," that must have been read with interest by the fraternity, but which also must have afforded them surprise in the nature of the facts recorded. Perhaps no clearer illustration of what may be accomplished in the line of increasing day consumption, by means of well directed and intelligent effort, has yet been put forward in this country than is afforded by the practice of Mr. Hallett at Springfield during the last four years. The figures as given are so concisely arranged, and carry their own story so plainly, that any comment of an extended nature here respecting them would of necessity savor much of reiteration. Yet we cannot help remarking that if the Springfield Company's output of gas for day purposes in the four months named—June, July, August and September—amounts to 10 per cent. of the total output for the year, its manager ought to come in for most hearty congratulation. Adding to this the knowledge that the aforesaid consumption amounts to an increase of 38 per cent. on the total sendout for the particular third of the year to which the tabulation refers, it looks to us that the solution of the fuel gas problem in the East—especially when one remembers in this connection what has been accomplished at Worcester and Lowell, Mass., at Providence, R. I., at New Haven, Birmingham and Hartford, Conn., and at Nashua, N. H.—in so far as the same refers to the domestic phase of the question, is as good as solved. One other striking outcome of the Springfield figures is the large quantity of gas—4,000 cubic feet per month—that is consumed per fixture per month. It is more than likely that many large ranges are in service, which also goes to show that the wealthier class of residents have taken kindly to fuel gas. The story of Springfield's success, so concisely and plainly told by Mr. Hallett, ought to be proof positive to the few remaining "doubters" of the poverty of their belief that there is no great profit in or field for the distribution of gas for fuel purposes by the existing gas companies of the day.

MR. HALLETT'S RESIGNATION FROM THE SPRINGFIELD COMPANY.—Elsewhere in this issue will be found a communication from "Observer," giving a synopsis of the doings at the annual meeting of the Springfield Gas Company. To our intense surprise and great regret we find that the leading feature of the session was the voluntary retirement of Mr. Hallett from all connection with the executive management of the Company. While it is not in any sense an agreeable task to refer to personal differences respecting the management of any business affair, we nevertheless, from an intimate acquaintance with Mr. Hallett, whose calmness of habit precludes the idea that he acted in this case with haste or without sufficient cause for his determination to sever a business relation that covered a period of 25 years, must hold him to have been the injured and aggrieved party. Place without honor and authority is valueless; and Mr. Hallett is not of the caliber of those who can content themselves in a persistent attempt to pose as placid "occupiers of emptiness."

OBITUARY NOTE—WILLIAM PARRISH, SENECA FALLS, N. Y.—Again are we called upon to chronicle the death of a member of the fraternity in the person of Mr. William Parrish, Treasurer and Manager of the Seneca Falls and Waterloo (N.Y.) Gas Light Company. Deceased, who succumbed, on the morning of January 24th, to an attack of pneumonia, was born at Canandaigua, N. Y., on April 23d, 1828, and was educated at the Canandaigua Academy. Having graduated, he visited the West, and on his return therefrom engaged in business at Buffalo, N.Y. In 1868 he succeeded his brotner Stephen in the general charge of the Seneca Falls and Waterloo Company, remaining in this position until death severed the connection. Deceased was elected to membership in the American Gas Light Association in October, 1881, and was a frequent attendant at its sessions. He served his Company faithfully and efficiently. His only public office was that embraced in a three years' term as Superintendent of the County Poor, the responsibilities attaching to which were borne in most worthy manner. A local authority, in a sketch of the life of deceased, says: "In his demise our village loses a citizen whose place cannot be easily filled. His many acts of kindness, his genial presence, and his sterling manhood, will long keep his memory green. He was one of the kindest of parents, a loving husband, an obliging neighbor and an accommodating friend, whose death is deeply regretted by the entire community. To the family in their affliction sympathy and condolence will go forth as sincerely from the hearts of strangers as from those of friends."

MANDAMUS PROCEEDINGS, SUPREME COURT, PHILADELPHIA, DECIDED AGAINST THE TRUSTEES OF THE ROMAN CATHOLIC HIGH SCHOOL.—Our readers have from time to time been informed of the various stages of the legal procedure in the case of the Trustees of the Roman Catholic High School, of Philadelphia vs. the Department of Public Works, and in concluding this history we can now say that the Supreme Court has sustained the ruling of the Court of Common Pleas, which was adverse to the Trustees. A summary of the case is that complainants asked for a mandamus requiring the Department of Public Works to make the necessary connections for the introduction of gas into the new Catholic High School, at Broad and Vine streets. The connection and service were refused on the ground that tenants of houses which had been on the site were indebted to the city for gas which they had consumed. The mandamus was asked for on the ground that the Trustees were in no manner indebted to the city for gas, and that no lien existed against land for gas used on premises over it. The lower Court refused on the ground that the ordinance reserving to the Trustees of the gas works the right to refuse to introduce gas into premises until all arrears due on said premises shall have been paid was one which it was within the power of the city to make and enforce. The Supreme Court indorsed this opinion.

FLEMMING BENCHES AT PHILADELPHIA.—The Philadelphia gas works authorities have decided to put in 24 benches of sixes, to be fired under the Flemming plan, at the Point Breeze station. Messrs. Gautier & Co., Jersey City, are to furnish the fireclay materials, the castings to be supplied by Jas. R. Floyd & Sons, of this city. This is good testimony to the value of the Flemming furnace, as the last contract is a sequel to the one awarded a year ago, under which the construction of 24 benches of this type was authorized.

MESSRS. CONNELLY & CO. REPORT GOOD BUSINESS.—Writing under date of January 29th, the Messrs. Connelly & Co., Limited, of this city, say: "Iron sponge is not only holding its own but its use is gradually extending all over the country, and the business increases each year. Our shipments during the present month exceed those of any month in the past, being almost 40,000 bushels, or 45 carloads—almost two carloads for every working day. In automatic governors we have done an unexpectedly large business during the present winter; for gas companies as a rule do not break connections and place machinery of this character during the winter. Notwithstanding this practice we have shipped 12 governors since the first of December; and from the numerous inquiries from all parts of the country we anticipate a regular boom in the enlargement of gas plants next season.

ANNUAL ELECTION, HOUSTON, TEX.—The annual meeting of the Houston (Tex.) Gas Light Company resulted in the following choice of officers: President, T. W. House; Vice-President, T. H. Scanlan; Secretary and Treasurer, G. R. Vaughn; Directors, Messrs. B. A. Shepard, T. H. Scanlan, Jno. T. Brady, Henry S. Fox and T. W. House.

THE works of the Freeport (Pa.) Gas Company were closed on 1st inst. The reason for this is stated to be the competition of natural gas.

ANNUAL MEETING, ILION AND MOHAWK, N. Y.—At the annual meeting of the Ilion and Mohawk Gas Light Company it was determined to construct a gasholder of 50,000 cu. ft. capacity. The officers chosen were: President, Hon. Thomas Ringwood; Vice-President, John Hoefler; Treasurer, C. W. Carpenter; Secretary, John V. Schmidt; Manager, John A. Giblin; Directors, Thos. Ringwood, John Hoefler, John V. Schmidt, C. W. Carpenter, A. N. Russell, F. C. Shepard, M. J. Richardson, Edmund Roche and H. D. Alexander.

THE offices of the Elizabeth (N. J.) Gas and Water Companies have been consolidated. Mr. Thomas P. Smith, for many years Collector for the Gas Company, has been appointed Secretary and Treasurer.

Flannery's Patent Gas and Liquid Holder.

On Jan. 21 U. S. Letters Patent (No. 419,845) were granted to Joseph Flannery, of this city, for improvements in gas and liquid holders. In his specification the inventor says:

The object of this improvement is to provide a simple and ready means for storing liquid, and particularly oil to be used in the manufacture of gas; to effect a saving of the gaseous vapors arising from the evaporation of the stored oil and prevent the escape of such vapor in the surrounding atmosphere; to provide means for forcing the liquid stored in the tank, therefore to guard against danger from explosion of the oil, and to effect a saving of ground space over what has heretofore been possible as such storage tanks have been erected. To accomplish these results I place a tank for containing the liquid directly within the the gasholder, whereby the tank will be always surrounded by water, by which the gasholder is sealed, and will therefore be always kept cool, and at the same time so inclosed as to be protected against danger from sparks or other causes which might tend to induce an explosion. I further provide the tank with a vent by which the gaseous vapors arising from the evaporation of oil within the tank may pass directly into the gasholder, thereby not only enriching the gas in the holder and preventing waste, but also providing against the escape of such gaseous vapors into the surrounding atmosphere, as is the common practice, by which the atmosphere is contaminated and the health of a neighborhood

Fig 1.

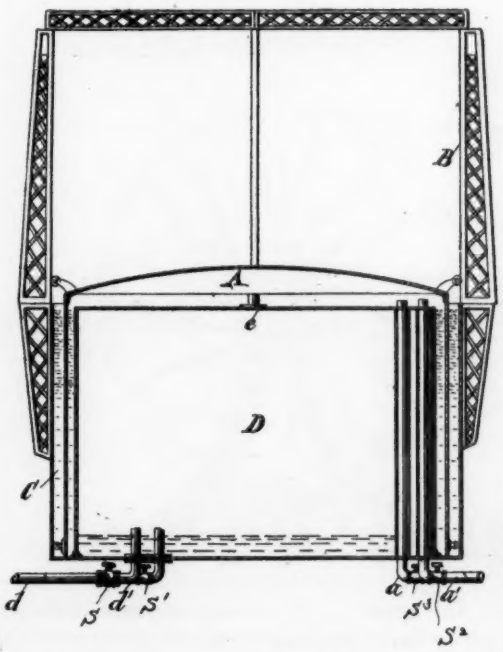
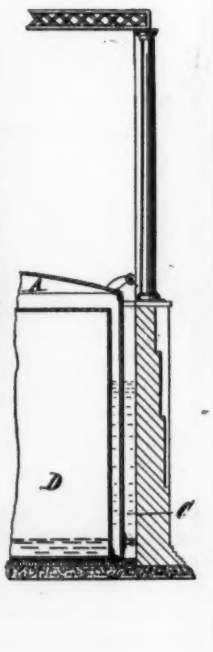


Fig 2



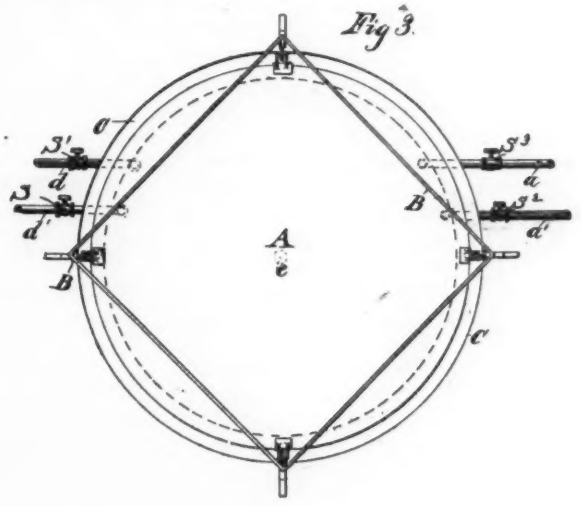
endangered. As the tank is in open communication with the gasholder, in which a heavy pressure is maintained, the weight of the holder and the pressure therein will operate to force oil out of the tank through its delivery pipe, and raise it to a considerable elevation when it is desired to withdraw the oil, the effect being that of a force pump. The arrangement of the tank within the holder will not curtail the gas space of the gasholder, for the reason that the space occupied by the tank is ordinarily filled with water. By placing the tank within the gasholder it will be seen also that a considerable saving is effected in the ground space over what could be effected if the tank and the gasholder occupied different and separate positions.

In the accompanying drawings Fig. 1 is an elevation, partly in section, of a gasholder and tank embodying the improvements. Fig. 2 is a similar view, but partly broken away to save space, and illustrating a slightly modified construction. Fig. 3 is a plan or top view of the improvement shown in Fig. 1. Fig. 4 is a vertical section of the tank, and shows a slight modification. Similar letters of reference designate corresponding parts in all the figures.

A designates the gasholder, which may be of the usual or any desired construction, adapted to be moved upwardly and downwardly in the frame *B*. *C* designates the well in which the lower portion of the gasholder is received and in which the water is contained. *a a*¹ designate gas inlet and outlet pipes, respectively, which may be of the ordinary construction and open directly into the gasholder. They are provided with cocks *s s*¹. *D* designates a liquid tank, which tank has, as shown, a closed bottom and top, and is secured at its lower side to the bottom of the well *C*. *d d*¹ are respectively filling and emptying pipes, by which liquid is delivered to and from the tank *D*. They are provided with cocks *s*² *s*³. *e* designates a vent in the upper portion of the tank, by which means open communication is afforded between the tank and the gasholder.

In Fig. 4 I have shown that a float *f* may be employed, which float is mounted upon a spindle *f*¹, extending upwardly through the vent *e*, and upon which is secured a valve *f*², adapted to seat upon a valve-seat *f*³,

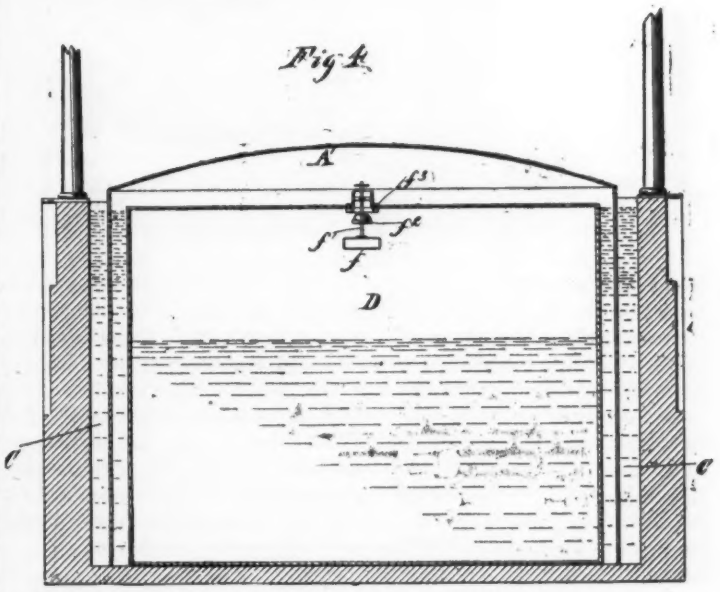
Fig 3.



formed upon the inner end of the vent *e* when the liquid in the tank shall have risen to a sufficient height. This will prevent any overflow of oil into the water space between the tank and the sides of the well when oil is contained in the tank.

In Fig. 1 I have shown the well as made of metal—such as plate iron—and in Fig. 2 I have shown the same as constructed of masonry. In the latter case the bottom of the well is formed of cement or similar material, and the tank *D* rests thereon.

Fig 4.



Gaseous vapors arising from oil stored in the tank will pass out through the vent *e*, and will become mixed with the gas in the gasholder, thereby enriching such gas and preventing the waste of said gaseous vapors, besides wholly confining them so that they cannot escape into the surrounding atmosphere.

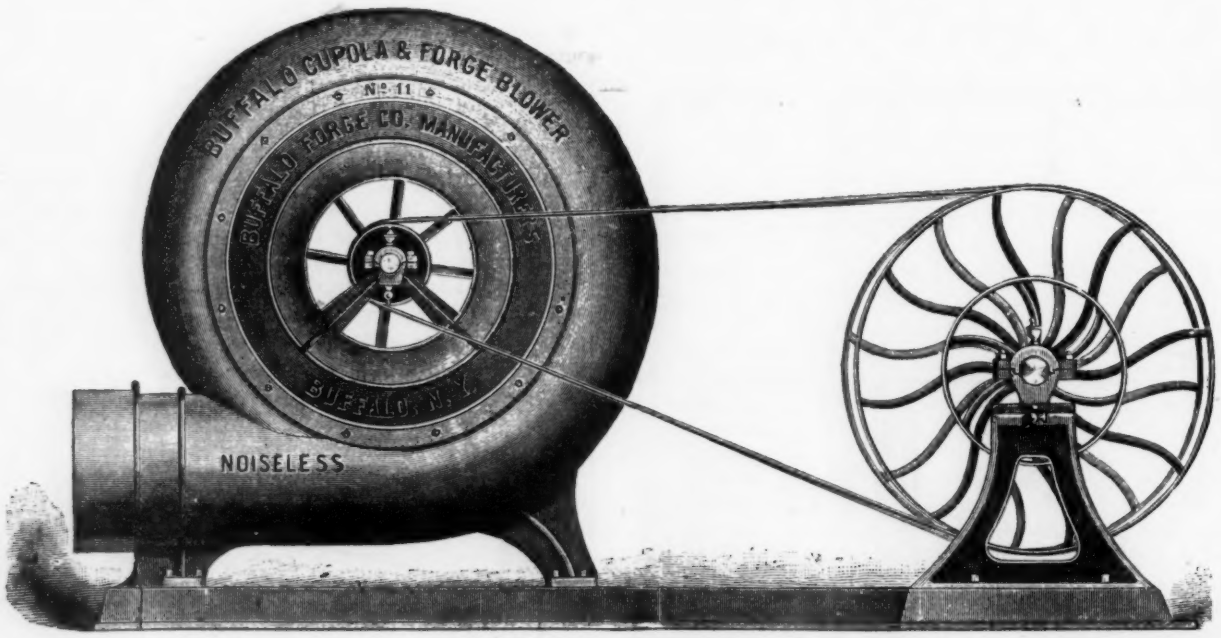
When it is desired to withdraw oil from the tank, the cock *s*³ in the filling pipe *d* is closed and the cock *s*² in the emptying pipe *d*¹ is opened. The weight of the gasholder and the pressure therein will then operate to force oil out through the emptying pipe and raise it to a level considerably above the level of the oil in the tank. This is advantageous where the tank and holder are situated at a level below that at which it is desired to use the oil.

Of course, instead of using separate pipes for filling and emptying the tank, both operations might be performed through a single pipe.

Steel Pressure Blower.

The accompanying engraving shows a Buffalo steel pressure blower mounted on an adjustable bed and provided with countershaft. It is designed and constructed with special reference to high pressure duty, such as supplying blast for cupola furnaces, forge fires and sand-blast machines; also for forcing air long distances. By means of a tightening screw the blower may be moved upon the bed while running at full speed, taking up any slack, giving both belts a uniform tension which is regulated at the will of the operator, and is an important point in preventing the inconvenience and loss incurred by a stoppage during heat when blowers are used for cupola purposes. A decided saving by use of the bed is gained in the wear and tear of belts, for a simple turn or two of the nut on the end of the adjusting screw and retightening of the holding-down bolts takes but a moment or two and accomplishes the same end as the relacing of the belts, which usually is put off until the belt will run no longer on account of so much slack. Special attention should be directed to pressure blower belts on account of the high rate of speed at which they must necessarily run, and absolutely perfect alignment of the countershaft with the blower is essential in order to secure smooth running, even tracking, and to avoid undue wear of belts by slipping.

A telescopic mouthpiece is employed in order that the blast piping may not be disarranged in moving the blower on the bed, while sufficient length is afforded to the countershaft so that tight and loose pulleys can be used for main driving belt; a self-oiling device fitted to the countershaft enables it to run at high speeds for long periods of time without heating or cutting. A prominent feature of these blowers is the solid case, the peripheral portion of the shell being cast in one solid piece, dispensing entirely with the objectionable "putty joint." Thus, being practically one piece, under the hardest service the bearing must always be in perfect alignment, vertically and laterally, with the rest of the machine. The journals are long and heavy, in the standard ratio of length to diameter of 6 to 1—, with cap bearings secured by bolts screwed in the lower half of bearing held in place by lock nuts.



The Specific Gravity and Illuminating Power of Coal Gas.

[Communicated by NORTON H. HUMPHRYS to the London *Journal*.]

Some little confusion seems to have arisen lately as to the value of the specific gravity test as a means of determining, or rather approximately indicating, the value of an illuminating gas; and it may therefore be interesting to examine some of the principal factors concerned. It should first be specified that the term "illuminating value" is very indefinite. It simply indicates the value of the gas as ascertained by one particular plan—the consumption at the rate of 5 cubic feet per hour in an Argand burner—which may or may not be favorable to the gas under examination. Further, the absurdity of regarding the results thus indicated as anything like an absolute quality of the gas is illustrated by the fact that by means of regenerator and other improved burners they can be eclipsed to the extent of three or fourfold. But so long as the parliamentary standard remains what it is gas engineers will have to make gas that will fit in with the standard, irrespective of its suitability for general purposes to the consumer. Judging from published analyses, a gas that will satisfactorily pass the 16-candle parliamentary standard may vary in composition within the following limits: Illuminants, from 3 to 5 per cent.; hydrogen, from 43 to to 53 per cent.; marsh gas, from 35 to 45 per cent.; carbonic oxide, from 3 to 8 per cent.; impurities, such as nitrogen, oxygen, air and carbonic acid, from 2 to 10 per cent. by volume.

There is no reason for supposing that the constituents of coal gas are present in other form than that of a plain mechanical mixture; and it therefore follows that the specific gravity is merely a sum of the specific gravity of the various constituents. The apparent simplicity of this method of arriving at its specific gravity is, however, greatly mitigated by the fact that obtaining an accurate analysis of coal gas is a very difficult thing. Even in the hands of the cleverest chemists it is scarcely possible to entirely exclude calculation. Very few published results are free from the objection that indirect methods of estimation have been resorted to in the case of one or two constituents at least. On the other hand, the accurate determination of the specific gravity by direct weighing is a delicate operation, calling for the best available skill. Not only must there be accurate weighing of the gas, but also accurate reading of the barometer and thermometer, to say nothing of some rather intricate arithmetic afterwards. It is not too much to assert that some of the published data on this subject are based upon experiments in which the whole of the above precautions were not rigidly observed. Sometimes, for practical purposes only, a rapid approximate test, such as the diffusion test, is used. In other cases the results quoted are gathered from foreign sources, originated in countries where different standards of temperature and pressure to those used in England prevail. But even after allowing for all these possible sources of error, there still remains a wide divergency to be accounted for.

Owing to the variations in weight, due to changes of temperature and pressure, to which it is continually subjected, it is not usual to give the actual weight of the sample of gas experimented upon. The result ultimately obtained represents the weight of the dried gas under standard conditions of temperature and pressure. And even this is not stated in direct terms, but as a fraction of the weight of an equal bulk of air under similar conditions. The weight of a cubic foot of dry air, at 60° F. and 30 inches of mercury, is about 537 grains; and, therefore, if the specific gravity of a gas is stated as 0.5, the actual weight is $537 \times 0.5 = 268.5$ grains per cubic foot. If this quantity of air has been standing over water it will have taken up about 1.7 per cent. of water vapor, and will weigh rather lighter—about 532.5 grains. But a cubic foot of gas, saturated with moisture, would be rendered rather heavier. The vapor of water at 60° F. is lighter than air, but not so light as coal gas. The reason for taking the weight of the dry gas is that the water vapor varies according to temperature and pressure.

If the several constituents present in coal gas were about equal in the

matter of specific gravity, a moderate variation in constitution would not have much effect as regards the weight. But, as a matter of fact, they vary over a wide range, as shown by the following table, which gives the principal constituents of coal gas, their specific gravity, weight of a cubic foot in grains, and ratio to an assumed specific gravity of 0.45, or 242 grains, which may be taken to represent that of 16-candle gas:

	Specific Gravity.	Weight in Grains.	Ratio.
Hydrogen	.069	37	0.15
Marsh gas	.553	300	1.20
Acetylene	.898	482	1.99
Carbonic oxide	.967	519	2.14
Olefiant gas	.968	520	2.15
Nitrogen	.971	521	2.15
Air	1.000	537	2.22
Oxygen	1.106	594	2.45
Carbonic acid	1.520	821	3.39
Benzene	2.695	1,445	5.97
Naphthaline	4.423	2,372	9.58

The highest constituent present is hydrogen, which is less than one-sixth the weight of the gas. It is rather singular that this is the only constituent that is lighter than the mean—all the rest being heavier; and with the exception of marsh gas nearly twice as heavy, and upwards. Several of the constituents are near the twofold limit; then there is carbonic acid; and lastly, the heavy vapors of benzene and naphthaline.

Assuming that the gas of 0.45 specific gravity contained the lower limit of hydrogen (43 per cent.) the effect of adding another 10 per cent. would be as follows:

$$\frac{(.45 \times 10) + .069}{10 + 1} = .415$$

making it lighter to the extent of nearly 8 per cent. Or the effect of taking away 10 per cent. would be:

$$\frac{(.45 \times 10) - .069}{10 - 1} = .492$$

an increase of nearly 10 per cent.

The addition of 10 per cent. of marsh gas would raise the specific gravity:

$$\frac{(.45 \times 10) + .553}{10 + 1} = .460$$

and taking away a similar quantity would lower it:

$$\frac{(.45 \times 10) - .553}{10 - 1} = .439$$

In a similar manner the effect of variation in the proportion of carbonic oxide can be arrived at. The addition of 5 per cent. of this gas would raise the specific gravity thus:

$$\frac{(.45 \times 100) + (.967 \times 5)}{100 + 5} = .474.$$

Or the deduction of a similar quantity would lower it:

$$\frac{(.45 \times 100) - (.967 \times 5)}{100 - 5} = .423.$$

From these calculations it is plain that variations in the proportion of hydrogen and carbonic oxide, which need not necessarily exert any marked influence on the photometrical value of the gas, may alter the weight and specific gravity to the extent of 10 per cent. or more in either direction.

Although the illuminants are present in small proportion there is reason to believe that they are certainly not less than four, and perhaps as much as five times as heavy as the mean. But in their case there is a compensating cause. If they are small in quantity, they must be heavier, and therefore richer in quality. It was this consideration that led Mr. Lewis Thompson to suppose that in gases of equal illuminating value the *weight* of the illuminants, which is a very different thing from the percentage by volume, would also be practically equal. Scientists and others who talk about coal gas being only charged with a trifling proportion of illuminants, have probably overlooked the fact that it consists of heavy hydrocarbons to the extent of 20 to 25 per cent. by weight. The 10 cubic feet of the gas above referred to would weigh 2,420 grains; and if it contained 5 per cent. of hydrocarbons, of which the average specific gravity was 2, the weight would be 537 grains, or more than 22 per cent.

But the chief cause of variation in specific gravity is the presence of impurities, such as nitrogen, oxygen, air, or carbonic acid. Not only do these range from 2.2 to 3.4 times the weight of the mean, but there is the important fact that an additional weight of illuminants must be present in order to make up for the depreciating effect of the impurities on the illuminating power. The removal of such impurities would cause an important increase in the photometrical value; and therefore a 16-candle gas containing appreciable quantities of them is, to all intents and purposes, an adulterated 17, 18, or 19-candle gas, according to the proportion present. The removal of the impurities would also be attended by a reduction in the specific gravity and at the same time improve the illuminating value of the gas.

The most common impurities of this class are nitrogen and carbonic acid. The former is very slightly heavier than carbonic oxide; so we may apply the calculation for that substance to it, and say that variations to the extent of 5 per cent., either way, in the proportion of nitrogen present, would cause the specific gravity to range from 0.423 to 0.474. The effect of carbonic acid is very similar; for although it is present in smaller quantities, its specific gravity is high. In towns where the sulphur clauses prevail this impurity must of necessity be removed from the gas. In other places, for reasons which need not here be entered upon, there is as much as 2 per cent. of carbonic acid in the gas. Applying the above form of calculation, we shall find that 2 per cent. of carbonic acid added to the gas increases the specific gravity to 0.480; or a similar quantity deducted from the gas will reduce the specific gravity to 0.424.

It appears that within the variations in constitution that are found to occur in the ordinary way of manufacturing gas from coal, the only constituent that is not likely to exercise an important influence on the specific gravity is marsh gas. This will probably not affect it to the extent of more than 2 per cent from the mean in either direction; whereas the others range from 5 to more than 10 per cent. With the exception of the illuminants there is no reason to suspect the existence of any compensating influence—*i.e.*, that the presence of a large proportion of any one constituent must necessarily result in the presence to a correspondingly small proportion of any other one; though, of course, if one is high, the others as a whole must be correspondingly less. In order to confine the specific gravity within reasonable limits of accuracy as an indicator of photometrical value it is necessary that the proportion of hydrogen and carbonic oxide present should not vary beyond narrow limits; and also that nitrogen, oxygen and carbonic acid should be conspicuous by their absence. If so much difference exists between samples of illuminating gas made on the same system, by the destructive distillation of coal, a much greater difference may be expected to obtain between the specific gravity and photometrical value of other kinds, such as oil gas, wood gas, or carbureted water gas.

The Operation of Felling an Electric Light Pole.

An observant New Yorker, in recounting some of the sights that attract crowds of the curious in this city, says that for several months past New York city has been endeavoring, through its authorities, to do away with all electric conductors stretched upon poles, and to compel the placing of them in so-called subways in the streets. The city, in carrying out this work, has frequently been called upon to take down a pole so located that the placing of it in a horizontal position called for nice judgment and well adapted rope connections. How these poles are taken down when they must be felled in exactly the right position, or in other words, when the top of the pole must not vary 4 feet from the line it stood in, are questions which of course interest every one. The method of taking down a pole, therefore, which stood between the elevated structure in Church street, and from which structure the house line of the building was not more than 7 feet away, presents points of general interest. After this pole had been relieved of its cross bars and all wires connected with it, it was stayed at the bottom with four ropes placed at right angles to each other and attached just above the cut. These ropes were intended to prevent any movement or jump of the butt of the pole. It was then provided with three ropes about midway between the top and the bottom, one of which was so arranged as to guide the descent of the pole, the other to prevent the pole falling in the opposite direction, and the third to insure the pole falling in a line with the elevated road.

The cutting of the pole at the base, evidently done by a backwoodsman, since he handled his axe with a degree of precision not found in the city, was begun on that side toward which it was desired to fell the pole. After he had cut beyond the center of the pole he began work on the opposite side. As he approached the dividing line between his cuts all ropes were tightened. Thus the butt of the pole by its four ropes was prevented from any jumping, and also the top of the pole was prevented from striking the building, where it might have done some damage, by the rope connected with the elevated railroad, and it was also prevented from falling too fast in either direction by ropes which extended parallel with the elevated structure. After he had cut about half way through this side of the butt of the pole, the rope was hauled on that side to

which it was desired the pole should lean, and as the pole gave way to this pressure the rope upon the opposite side was played out, while that toward the elevated structure was so guided that the pole just missed the cross ties; and in this way was lowered to the street without any hitch whatever, and without deviating 12 inches from the line it should have followed. The system of taking down poles, as developed here in New York, shows that by the simplest means any pole can be felled and carried down within the closest limits; in other words, as was the case with the pole above mentioned, it can be taken down by an elevated structure projecting over the sidewalk and between the buildings on the line of the sidewalk, and yet can be done easily and gently and without in any way interfering, beyond a few minutes, with travel on the elevated road or on the sidewalk.

The Dangers of Electric Lighting.

By S. Z. de Ferranti and Francis Ince.

[These authors have prepared the following review (for *Engineering*) of the dangers of electric lighting. The concluding portion will be given in our issue for February 10th]:

The time has now arrived when it is absolutely necessary for the public generally to clearly understand one or two matters connected with electrical science, and we propose to explain to the uninitiated certain electrical terms, and, having explained them, to show what are the "dangers of electric lighting," whether a high tension or a low tension system is used.

In the first place it is of primary importance to understand that, when dealing with an electric current, two things require immediate attention; first of all, the "tension" or "pressure" of the current; and secondly, the "quantity," and to understand fully the meaning of the terms pressure and quantity, take water by way of illustration. With water no one has any difficulty in understanding that, with a pipe of a given size, and with water flowing through it from a cistern placed 20 feet above it, a certain quantity of water would flow through the pipe in a minute; but if the cistern were then placed 40 feet above the pipe, a considerably larger quantity of water would flow through the same pipe in a minute, this result being brought about by the extra pressure due to the water falling through 40 feet in lieu of 20 feet. Tension or pressure of an electric current, technically called "volts," may be taken as similar to water pressure. Now, with regard to quantity, here again a pipe of a certain size will, at a given pressure, allow a certain quantity of water to flow through it in a given time, and if the water pressure be doubled, about twice the quantity of water will flow through it in the minute. So again with the electric current, if a conductor, or bar, or tube of copper of a given size be taken, the quantity of current which will pass along it varies with the pressure; that is to say, that if the current is sent into the conductor with a pressure we will call one, a given quantity of current passes along the conductor in a minute, and if we have a pressure of twice one, or two, twice the quantity of current will pass along the conductor in the minute. Quantity is technically called "amperes."

We will now pass to another matter; we must consider what work—or useful energy—can be got out of a current. This is arrived at by multiplying the pressure and the quantity together, and the result is called "watts," and watts, therefore, represent the actual work—or energy—any given current will give. Now let us explain clearly what this means. A horse power is a power capable of raising a weight of 33,000 pounds 1 foot high in a minute, and to perform this work 746 watts are required, that is to say, the pressure of an electric current multiplied by the quantity must give the answer 746 to make the electric power equal one-horse power; thus a current with a pressure 1 (1 volt) and with a quantity 746 (746 amperes) will equal one-horse power, or a current with a pressure 2 (2 volts) and with a quantity 373 (373 amperes) will also give one-horse power, as $2 \times 373 = 746$; or again, if we have a pressure of 746 (746 volts), and a quantity of 1 (1 ampere), the two multiplied together still give 746, and thus we should still have a power equal to one horse.

Now, it will be remembered that when dealing with water passing through a pipe, the quantity passed in a minute was about doubled if the pressure was doubled; therefore if you wish the pipe only to deliver a certain quantity of water in a minute or to do a certain work, the size will be reduced, if your pressure is increased. So with electricity, if you increase your pressure you decrease the size of your conductor, as the quantity of electricity always passing will be less, to do certain work.

To make ourselves clear, let us give an illustration: The pressure at hich electricity is used ordinarily for lighting incandescent lamps is 100 (100 volts), and the quantity of current a 10-candle power lamp consumes is .35 (about $\frac{35}{100}$ of an ampere); therefore to light 5,000 of such lamps a current is required at the constant pressure of 100 (100 volts) and the quantity that would be required is $5{,}000 \times .35$, or 1,750 amperes, the energy consumed in watts being equal to the pressure (100 volts) multiplied by the quantity of 1,750 amperes, the result is 175,000 watts.

Thus to light 5,000 lamps, the current being sent out from the central station at a pressure of 100 volts, a conductor would have to be provided which would carry in quantity 1,750 amperes; thus the pressure 100 × by the quantity 1,750 gives 175,000 watts, the power required to do the work. Now, if the current were being sent out from the central station at a pressure of 10,000 volts, a conductor would have to be provided which would carry in quantity 17.5 amperes only; thus again the pressure 10,000 × by the quantity 17.5 would again give 175,000 watts, the power required to do the work, and the size of the conductors required therefor in the two cases to do the same work would be in the proportion of 1,750 to 17.5, that is to say, that with a pressure of 10,000 volts the size of the copper conductor would be about one hundredth of the size required if dealing with 100-volt current only.

It is now only necessary for us to point out one other scientific fact, and we shall then be in a position to clearly consider "the dangers of electric lighting;" that fact is that for heating purposes the quantity of the current only has to be considered, and not the voltage or pressure, as it is the passing of too great a quantity through a conductor that causes it to heat, and ultimately to melt, irrespective of the voltage or pressure, which has nothing whatever to do with heating. A pipe, if too much water for its strength was being forced through it, would burst; the electrical conductor with too much quantity through it heats and ultimately melts. Thus, if a conductor is put under ground of a size sufficient to carry current for 5,000 lamps only, and we turn on 10,000 lamps, the conductor will heat, and if we go on turning on more and more lamps, the conductor will ultimately melt at the weakest point, when the continuity of the conductor will be broken, no more current will be passed, the lights go out, and no further danger exists. Now, besides giving a conductor too much work by putting on too many lights, there is a second way in which an underground conductor may be made to do too much work, and so to heat or melt—that is to say, if the conductor is so constructed that it can, and is so placed in the ground that it may, and it does, come into contact with another conductor, such as a telephone or telegraph wire, a gas or water pipe, the current will leak into and through such other conductor, and will find a short way back to the central station from whence it came in preference to going through the lamps or doing other work, the resistance in going back through the earth by the short cut being less than the resistance of the work to be done; just in the same way if a pipe bursts, the water will spout out at the burst point in every direction, as the resistance is less at that point to the water than the resistance in the further length of pipe, if the water were to proceed to do its work; again, as before pointed out, the pipe bursts under the pressure, but the main at the point of contact with another main or wire, where the rush of the current takes place, heats, and finally melts, setting fire to or melting anything in its neighborhood. Here is the danger of fire. Now let us see how this danger is got over in this country. As before pointed out, if too many lights are put on any main, or conductor, the main heats and finally melts at the weakest point; and in the second case, where the conductor comes across another conductor, as above pointed out, there is an enormous rush of current through the conductor, it heats and ultimately melts at the point of contact. Now, how is this danger to be entirely got rid of? The question is in fact answered by the above statement, which must be clear to any one, that when too many lights are turned on the conductor heats and melts at the weakest point.

What have we to do, then? We place at our central station, close to the dynamo which generates the current, the weakest point in every main or conductor that leaves the station; this weakest point is a short bridge of copper so slight and of a so carefully calculated capacity that if a conductor is of such a size that it should be used for lighting 5,000 lights only, if 6,000 lights are turned on the rush of current is too great for the bridge, and it melts or fuses (hence the bridge is technically called a fuse), and that main or conductor is cut out long before any part of it even becomes warm. But you say, What occurs if it is not too many lights that are turned on, but is a contact, as suggested, with another conductor or a gas pipe? Consider for a moment what happens at the point of contact; there is a too great rush of current to that point, and the result therefore is the same as turning on too many lights; if there is too great a rush of current from any cause it must all pass over the bridge into the conductor, and the bridge cares not for the reason that causes the great flow, but the great flow instantly causes the bridge

to fuse, and with a conductor so arranged accident by fire is an impossibility. Mr. Edison has said, in a recent article by his pen on the same subject as that on which we are writing, that "near the corner of William and Wall streets, New York, the underground conductors of the Edison Illuminating Company became crossed (by which he means they came in contact), and the current which was passing through them at a pressure of 110 volts melted not only the wires but several feet of iron tubing in which they were incased, and reduced the paving stones within a radius of 3 feet or 4 feet to a molten mass." Now no man knows better than Mr. Edison that the tension of the current in the mains to which he refers had nothing whatever to do with the heating effect of the current; it was the quantity, and the quantity alone, that caused the heat. Now, if his main were lighting 5,000 lamps of 10-candle power at 110 volts, the quantity of his current would have been, roughly, about 1,700 amperes, and by the contact, this quantity would have been enormously increased, whereas if he had been using a 10,000 volt current his quantity, as we have seen, would have been only 17 amperes about, and the heating power of his current would have been 100 times less; but where was Mr. Edison's bridge or fuse at his central station?

It is clear that he could have had none, or it would have melted before any damage could by any possibility have been done; and his statement proves, as the reader will see, not that a higher tension would have been more dangerous (it would have been safer), but that the work at the station to which he refers must have been done on most incorrect and inefficient principles. Mr. Edison may argue that with increased pressure it is possible to force a greater quantity through a main, and that therefore a 10,000 volt pressure is more unsafe than a 100 volt pressure; but this is not the fact—as the conductor to be melted is in size only one hundredth of the size of his main it will heat and melt sooner, and there is not the same quantity of molten mass to deal with; but the real answer is, that the bridge or fuse at the station, if used, is, with either low or high pressure, the real safety, as it will never allow so large a quantity of current to pass over it as is necessary to cause the conductor to heat, no matter whether the pressure be 100 or 10,000 volts. Take again the calorific effect of the low tension system. We have seen that to do the same work, the low tension system requires 1,750 amperes against 17.5 on the high pressure, and thus if an accident does happen on the low tension system, the immediate calorific effect of 1,750 amperes is called into play. Now, if on the high tension system such an effect could be reached, our engines would be called on to do an absolute impossibility, as they would be required to give 100 times their nominal power before the quantity and equal heating effect of 1,750 amperes could be reached.

Then comes the further question, How did Mr. Edison's mains become crossed, or rather in contact, with another conductor crossing his mains at right angles apparently at a street crossing? This must have arisen through the negligent way in which the Edison mains were p'aced underground without sufficient protection. It is idle to suggest that this is a danger that cannot be guarded against. It is easy enough to protect one conductor underground from coming in contact by any possibility with another crossing it, and we should be wasting the reader's time if we were to attempt to describe the thousand and one ways in which this may be done, for many will suggest themselves to every reader. But the further question arises, Is it not possible to construct your mains or underground conductors in such a manner that the passing of another main or conductor at an angle above and in contact with it will produce no harmful result whatever? The answer is Yes, distinctly yes.

(To be continued.)

The Demand for More Light.

The *Gas World*, in commenting on the demands for more light, says that in mentioning Bristol as a town where talk about "bad" gas has been somewhat prevalent during recent months we do so only to direct attention to the growing desire of the general public for more light. A decade ago a light that would make darkness visible was considered good enough; and any company seeking parliamentary powers was seldom asked to bind itself to the supply of gas of more than 13 or, at most, 15-candle power. The Bristol United Gas Light Company, working under Acts obtained many years ago, is legally bound to supply gas of only 13½-candle power, and very few English companies are called upon to supply 16 candles. That is the full pound of flesh the public can demand, but, as a matter of fact, very little gas is supplied in this country under 16 candles. The Bristol Company, while it may with impunity supply 13½-candle gas, actually supplies 16-candle gas; and as in Bristol so in nearly every other town and village throughout England. Yet, notwithstanding this generous interpretation of the bond by the gas companies, the continuous cry of the public, or rather of the public's representatives in council assembled, is "give us more light." To have a "dim religious light" in the streets is not sufficient for the present generation; the light of to-day must be brilliant and all pervading. If we were asked to state what has brought about this change in the public taste, we would say, naming the causes in order of merit, (1) the desire to improve upon the achievements of the past; (2) the example of private enterprise; (3) the impression left upon the public mind by a passing acquaintance with an arc lamp. In an age which we are proud to call an age of progress the desire to improve the public lighting of our streets is a perfectly natural one; a comparison between the general lighting of the streets and that of the outside of an enterprising tradesman's shop (a comparison which most of us involuntarily make every day of our lives) shows that such improvement is, not only possible, but ridiculously easy of accomplishment; and the electricians are continually pushing their arc lamps under our noses, as much as to say: "If the gas companies won't satisfy your desires, we will."

But here the trouble arises. The public wants more light, and because it does not get it, says the gas is "bad." As we have already said, the gas is better in quality than the requirements of the Legislature demand; so to be honest the public must either give up the cry of "bad" gas or set about mending the legislation under which it is permitted to be "bad." There is no medium course so far as the quality of the gas is concerned. But before hastily amending the legislation we would recommend those who are dissatisfied with 16-candle power to see how "bad" even 30 candle gas can be made to appear. We were recently passing through the Fair City of Perth after the sun had set upon its fairness, and although gas of nearly 30-candle power was being burned in the street lamps, the streets would have had anything but a pleasing appearance had it not been for the light streaming forth from the shop windows. What the city is like after the shops are closed we did not wait to see. When this is the condition of affairs where the gas is 30-candle power it must become apparent to the most enthusiastic anti-gas municipal ruler that deficient street lighting cannot be wholly attributable to the low illuminating power of the gas. He may even begin to suspect that the fault lies with his own method of using the gas supplied to him. If he does so there is hope, for he is now on the right path toward improvement.

You cannot light a palace with a candle; neither can you light 30 yards of street by the combustion of 2½ cubic feet of gas per hour through an antiquated burner. The man who attempted the former would be called something not very polite. The latter is equally impracticable, but when the inevitable failure ensues the gas is "bad!" All this cry about "bad" gas is simply beating the air. The public wants more light—there cannot be a doubt about that—but for its new requirements the public must pay—either by paying the extra cost of a higher illuminating power or by consuming more of the present quality gas by means of improved apparatus. Gas companies are paid for providing a certain quantity of light; they cannot be called upon to supply double, or any other multiple of that quantity for the same money. Municipal rulers must therefore face the inevitable by providing the extra money required to pay for the extra light demanded by their constituents. This extra light can, as we have indicated, be obtained in two ways—by increasing the illuminating power of the gas and adhering to the present consumption per lamp, or by increasing the consumption and adhering to the present illuminating power. To our mind the latter course is the proper one to pursue. By increasing the illuminating power you cannot afford that distribution so essential to street lighting, and you also compel the private consumers to pay an extra penny or twopence per 1,000 cubic feet (as the case may be) for an extra illuminating power which many of them do not desire. By adhering to the present quality and increasing the consumption you can distribute the light more evenly, and obtain a higher yield of light per cubic foot of gas consumed by taking advantage of the well known law that within limits the greater consumption in an individual lamp the greater the yield of light per cubic foot of gas. Indeed, under this law you obtain light for which the gas company does not get a farthing.

The subject is one which demands the most careful consideration by those charged with the lighting of our streets. We do not now put the case as one of gas *versus* the electric light; we are simply dealing with the growing demand for "more light." To satisfy that demand will cost money—whether the result be obtained by a more generous and scientific use of gas or by the introduction of the electric light. That gas can satisfy the demand is abundantly proved by what has been done in different corners of London, in Brighton, and in every town where a gas

installation has been fitted up under the eyes of competent supervisors. That the electric light can satisfy it has yet to be proved. In Barnet and in Leamington the incandescent electric lamps have been woeful failures (both financially and practically); and any one who has had experience of the arc lamp must admit that its distributive and diffusive powers are not of a very high order.

Pile Protection.

Mr. J. A. Pritchard not long since read before the Ohio Society of Surveyors and Civil Engineers a very interesting paper on the subject of "Pile Protection." An extract of this paper is appended:

It has been a study with landowners along the streams (I would add here by way of parenthesis that I refer to those who believe in taking care of land, and not those who allow things to go to rack) to devise some effective and cheap method of protecting banks and levees. Some have tried to do this by building cribs of round timber and filling with brush and boulders. These caused the wash to be more instead of less, and were considered failures. Others have built brush dams, excavated new channels and changed the course of the stream. While one attempt at this was successful others failed, and the expense of making a new channel was considerable. In the fall of 1887, there was commenced a system of pile protection, of which there was put in at that time 742 feet in all, which consisted of three wings, and 546 feet, which was in one continuous curve of about 475 feet radius, the piles of which were driven close up to the bank and sheeted on the water side with 2-inch oak sheeting. But it is the wings that I wish to speak of, as to place a continuous sheet along the water front of a large farm that is liable to wash would be rather expensive. The wings are constructed in the following manner: No. 1 is located where the creek makes a curve of 800 feet radius, and consists of thirteen piles seven feet from center to center, seven of which were driven close up to the bank. The remaining six were placed across the stream at an angle of 45°. Brush was then laid across the line of piling well out into the stream. The bottom plank of the sheeting was then forced down on the brush and made fast by 6-inch wire spikes. The sheeting was placed behind the piles on the bank part, and is held in place by a back filling of brush and gravel. On the part which extends into the stream, the sheeting is placed on the front or upper side, and is secured to the piles by 6-inch wire spikes. The top piece of sheeting is made double, and in such a manner as to break joints, and is bolted with ½-inch bolts, two to a pile. The extreme 35 feet which extends into the stream is double sheeted, and in such a manner as to break joints between the piles, and is bolted at the joints to a 4-inch by 6-inch stay, placed behind the sheeting, with ½-inch bolts. The piles were driven by horse power with an 800-pound hammer. The leads were placed on a common farm wagon, and were about 16 feet full length. The length of this wing is 84 feet. An estimate of the cost would be:

Thirteen piles, fourteen feet long, at $1.50..	$19.50
Driving same, at $1.50.....	19.50
Boarding three men and team..	5.00
Sheeting, 1,320 feet, at B. M. $68 per 1,000..	24.90
Placing sheeting and back filling.....	10.00
Bolts and spikes	3.00
Total.....	$81.90

I would here say that the cost of the whole 742 feet was between seven and eight hundred dollars, or about one dollar per foot. The effects of this wing has been to protect the bank for about 400 feet, at which point the wash originally began, on the opposite side, but since the wing has been placed has begun further up the stream. It also had the effect of deepening the channel, which before was about 2½ feet and now is 4½ feet deep. Wings Nos. 2 and 3 are built in the same manner, but with a more favorable location and 28 feet less in bank part. No. 3 failed, the stream end having washed out when the ice broke up in the spring of '88. The depth of water where it stood is now about 11 feet. Wing No. 3 is 190 feet below No. 2, and the current does not strike the bank between them, although they are on a curve with a radius of 475 feet. One hundred and sixty feet from wing No. 3 the continuous sheeting begins. My opinion is that the better practice would be to cross the current at an angle not to exceed 20°, and continue the wings 20 to 30 feet further, according to circumstances, and the piles should be longer than those used in this case, and be driven lower, so that when the ice breaks up, that with a moderately high water it could flow over the top of the wing. And there should be two piles driven from 8 to 10 feet back of the wings, and two heavy round timber braces placed at the end pile and the third from the end to insure stability, as the weight sustained during an ice gorge is tremendous. I am not aware that any engineer was called on to plan or locate the work that has been done, but I think that by being properly located, that a wing, not to exceed a cost of eighty dollars, can be made to protect a bank from 200 to 500 feet, according to the curvature of stream where located.

Fifth Annual Report of the Massachusetts Board of Gas and Electric Light Commissioners.

The Fifth Annual Report of the Board of Gas and Electric Light Commissioners has been presented. In the State there are 75 gas companies, 26 of which have the right to supply both gas and electricity, and 100 electric light and power companies. So far the policy of the Legislature, as shown in the various acts for the regulation and control of gas and electric companies, has been fully justified. The work of the Board in executing these laws has been done with a constant regard for the welfare of the communities in which it was called upon to act. It has had, following the policy indicated by the Legislature, great confidence in the wisdom of allowing one company to do all the lighting in smaller cities and towns. When consumers have been shown the powers of the Board to regulate the price and quality of light a general approval of the enactments and of its action has been manifested. The companies are as a whole very ready to correct any fault to which their attention is called by the Board. In executing recent statutes the Board has reluctantly been compelled to refuse new companies the privilege of going into business, but these adverse decisions were felt to be most beneficial to the permanent interests of the city or town. Seven gas companies have been authorized to engage in electric lighting business, and there have been six cases before the Board on appeal from the decisions of the Mayor and Aldermen and Selectmen of as many cities and towns. The various decisions are given at length.

In the past year the property of the Cottage City Gas Company has passed to a new company, but the business has been so interrupted that no report of value could be made. The Citizens Steam and Gas Light Company, of Lynn, gave up making gas early in the year, and its works were destroyed in the late fire. The New Bedford Company has been authorized to supply gas to Fairhaven.

The Board since its last report has continued its investigations on the subject of water gas. It is understood that the parties in interest do not desire to offer further evidence in the cases pending at the close of the year. The Board believes that some modification of the present law is desirable, and that a report of the work of the Commissioners in this branch of their duties ought to be made to the Legislature at the present time. Accordingly a very long and interesting chapter is devoted to water gas. The Board, by personal inspection and correspondence, has heard from more than a hundred companies. So many different items and circumstances enter into the manufacture of gas that it is not easy to exactly determine the relative cost of water and coal gas; but from a wide survey the Board estimates the cost of coal gas in the holder at from 50 to 57 cents per 1,000, and of water gas at from 46 to 55 cents. Various improvements in the manufrcture of water gas are noted, and the advantage afforded by its apparatus in the production of gas of the high illuminating power now demanded is alluded to. The larger companies recognize these advantages, and nearly one-third of all the companies in the country now manufacture some water gas. Various benefits resulting from the manufacture of both kinds of gas in the same works are specified.

The question of the comparative safety of water and coal gas is pronounced a very perplexing one to solve satisfactorily. One or more members of the Board have examined personally the premises where deaths have occurred from asphyxiation by inhaling gas. A few of these deaths were caused by coal gas, others probably by a mixed gas, but the larger number were due to water gas. Results of the investigation are given in detail. As near as can be estimated from reports received from various sources there were 107 deaths in the United States, in 1889, from inhaling illuminating gas. There is conclusive evidence that 30 of these persons committed suicide, and there were several others where the circumstances pointed to the same fact. But this leaves 77 deaths caused by the accidental inhaling, 25 happening in places where only water gas is manufactured; 46 occurred in places where mixed gas is made; and 6 in towns using coal gas only. Forty-six of the deaths occurred in hotels, mostly of the cheaper class, lodging and boarding houses, where the rooms were small and poorly ventilated. In 18 of the accidents the gas was blown out by ignorant persons; 8 deaths were caused by gas stoves; 1 by a leaky pipe, and 3 by defective keys where the gas is turned on to the burner. Various statistics bearing on these deaths are given, and the inferences drawn are that about 30 per cent. of the deaths from illuminating gas are

suicides, 20 per cent. are persons more or less intoxicated at the time of the accidents, and a considerable number are persons unacquainted with the use of gas. A comparatively small number of cases are purely accidents that could not have been avoided.

The Board's interpretation of chapter 428 of the acts of 1888, is that it is not permitted to issue a revocable license or one subject to modification, or qualify in any way the certificate they issue "that in their opinion the gas can be used with safety" for illuminating purposes. The danger which appertains to the careless use of any gas is an obstacle in the minds of the Commissioners against granting a license in the form required by the law. The question of the comparative safety of the various kinds of gas and the considerations bearing upon their use are discussed, and suggestions advanced as to the means for securing greater safety. The Board is firmly of the opinion that the certificate as to safety ought to be omitted from the license, and that it should be empowered to place such conditions in the license as will tend to guard the community against accidents. A draft of a bill embodying these ideas is submitted.

The usual elaborate tables are included in the report. These are prepared by the efficient clerk, Mr. Walter S. Allen, and involve a great amount of labor. The average price for coal gas to consumers of 24 companies making more than 30,000,000 feet each is $1.4495 a thousand. The average for the rest is $1.987, an average for all of $1.4935 a thousand. In 1886 the average price was $1.72, in 1887 it was $1.66, and in 1888 it was $1.56, showing a gradual reduction each year. The number of meters in use June 30 was 100,714, representing a capacity of 742,781 lights, an increase of 5699 meters, or 41,930 lights.

The number of public gas lamps continues to diminish in about the same ratio as last year, electric lights taking their places. The coal gas companies lost 999 lights.

The total income of all the companies was $4,869,342.11. The expenses were $3,314,337.98, leaving the net income $1,555,004.13.

The year was an active one for those engaged in the electric lighting business. There were 44 new electric light and power companies, and 4 new companies for the manufacture of gas and electric light incorporated. The Board says there is a demand for a simple and economical means of testing the candle power and quantity of electricity supplied to consumers.

The demand for both gas and electric light is constantly growing, and the advance in electric lighting has been especially noteworthy. The following table shows the number of electric lights of various candle power in use in the State in 1888 and 1889:

	1888.	1889.
16-candle power	52,075	80,075
20 " "	1,200	2,800
15 " "	880	880
2,000 " "	5,846	6,978
1,200 " "	2,757	4,206
1,600 " "	110	130
1,500 " "		35
1,800 " "		40
800 " "		140

Annual Meeting of the Springfield (Mass.) Gas Company.

"Observer" forwards the following regarding the annual meeting of the Springfield (Mass.) Gas Company:

The annual meeting of the Springfield Gas Company was held on the 27th of January, and resulted in some radical changes in the management, the most important of these being the resignation of Mr. J. L. Hallett from all active participation in the direction of the Company's affairs. To say that this will be regretted by the Eastern fraternity is to put it mildly; and, speaking for myself solely in giving utterance to the opinion, I have every reason for believing that a certain clique in the ownership are responsible for having made it so unpleasant for Mr, Hallett that in justice to himself he could no longer retain the place and preserve his self-respect. When the situation is fit for final review I will forward a statement of the case for the judgment of your readers.

To come back to the proceedings, Messrs. J. L. Hallett and W. H. Wesson retired from the Board of Directors, and were succeeded by Edward S. Brewer and James Kirkham. The plan announced some time ago to separate the offices of Treasurer and Superintendent was carried out, and Ira B. Allen was chosen Treasurer, receiving a large majority of the 3,484 shares of stock represented. Joseph L. Hallett, who has held for two years the offices of Treasurer and Superintendent, had sent in his resignation of the latter office to the Board of Directors a week ago. The Directors tabled the resignation, and Mr. Hallett appealed yesterday to the stockholders. As they took no action to define the duties of Treasurer and Superintendent, Mr. Hallett will persist in his resignation as Superintendent. E. S. Brewer was chosen clerk of the corporation to succeed Ira B. Allen.

As stated in Mr. Hallett's report given below, the trouble in the management of the Springfield Company has been partially due to a misunderstanding between Mr. Hallett and the bookkeeper, Ira B. Allen, who has for some time been ambitious to become Treasurer. After a dispute about the conduct of each regarding the Treasurership, Mr. Hallett discharged Mr. Allen. The Directors questioned Mr. Hallett's right to take such action, and Mr. Allen was taken back at their request. This resulted in Mr. Hallett's resignation as Superintendent and Manager. Mr. Hallett has been with the Company since his return from the war 25 years ago, and has been its Manager for eight years. Below is the report he submitted as Treasurer, Manager and Superintendent of the Company:

The manufacturer feels a sense of pride when, as the time comes around for the semi-annual and annual accounting, the balances are all found on the right side. This is especially true when the business is threatened with loss from competition. There was a time when the gas lighting industry was practically a monopoly and the gas manager independent of criticism. There was no thought of seeking trade; it must come to him, and every foot of service pipe and item of labor was charged to the consumer at a large profit. Nor is it long since a tax was levied on the consumer for the use of that indispensable machine, the meter, of equal benefit to both producer and consumer in determining the amount of the gas bill. Then 3½ cubic feet of 15-candle power gas to the pound of coal was thought creditable, and a shrinkage of 20 per cent. in the annual output was of such little consequence it was not considered worth digging for; 18,000 feet to a bench of retorts was an excellent result. The gas business of 1890 is wholly unlike that of former years. Competition and would-be competitors, cheap oil with improved burners, have stimulated the gas manager to greater activity. The yield of gas from the coal has nearly doubled. Candle power is 25 per cent. better, and the unaccounted-for gas reduced to a minimum, while the price now charged the consumer is less than the product then cost. Instead of 18,000 feet to the bench 50,000 is now obtained. Improvements in the method of making and using gas have placed the gas business on a better footing. In lieu of the old-style closed globe and iron burner with its flickering light, opal, etched and ground shades, with large opening and automatic governing burners, have been substituted, producing a soft and pleasant light. The Lungren and arc high power burners (the latter made in this city) have met the demand for more light, have displaced the electric light in some cities and to a limited extent here.

The encircling of the city with electric wires, cutting out hundreds of gas lamps, means a diminution of millions of feet in the annual output. Nor is it a pleasant thing to see the names of some of our best consumers of years standing dropped from the gas ledger by the inroad of a competing light company, with the only alternative to erect an electric plant or purchase from others a franchise of doubtful profit. Considering the large growth in population and general business prosperity, the effect of competition has not yet been felt. In fact, the records show an increase of over 3,000,000 feet over the previous year. Nor would there be any loss in the annual sales, in my opinion, were the charges for electric lighting put on a paying commercial footing. This is evident from the number of electric companies throughout the country that have sunk their entire capital and sold out for a sum equivalent to their debts, have gone into insolvency, or are doing business at a loss. While we are losing some customers as the electric light system is extended, it is equally true that as the electric light becomes no longer a novelty, and as it is demonstrated that for the same money more light is obtained from gas, with more reliable service, our former patrons return to gas lighting.

During the year special efforts were made to increase the summer consumption by the use of gas stoves. This is a department of the business that admits of large development. Stoves and ranges for domestic and mechanical purposes, and gas engines for power, have reached a state of perfection that, for efficiency and economy, can without hesitation be recommended. Our policy in regard to stoves is, where possible, to sell them at cost rather than to rent, believing that an article that costs something would be more appreciated and have better care than if the property of others. To show what limited knowledge the public has of these appliances, in a canvass made last summer we found those who did not know what a gas stove was. Others were prejudiced, and thought the daily use of gas for cooking would be a ruinous expense. To overcome these objections 275 stoves were given away, and these helped the sale of

as many more. The result was, the skeptical were more than pleased, the old kerosene stoves discarded forever, and statements made by some that, to their surprise, the cost of gas was no greater than it had previously been for oil. The revenue from these gift stoves in one season paid their cost and a profit beside. Seventeen ranges, 48 heating stoves and 506 cook stoves were sent out during the year, making about 1,900 now in use. Thirty-eight per cent. of the output for the months of June, July, August and September, and 10 per cent., or 8,000,000 feet of the whole amount of gas made in the year, can be credited to gas stove account. The people have only to learn the advantages of cooking and heating by gas, and they will readily adopt it in preference to all other fuel. The State Gas Inspector reports that the illuminating power and purity of the gas is better than in any previous year.

The report for the year shows that 7,015 tons of coal have been used, an increase of 230 tons over 1888, while 46,290 gallons of crude oil have been consumed, an increase of 4,678 gallons over the previous year. There were 82,582,000 cubic feet of gas made, an increase of 3,363,000, while there were 758 meters set. There have been 13,043 feet of gas mains laid, against 10,935 the preceding year, while 159 houses have been connected with gas, 19 with steam, and 571 gas stoves and ranges have been disposed of. The city has disused 483 public lamps. The average candle power of the gas has increased to 18.58, from 18.24 in 1888, while the sulphur has been reduced from 9.88 to 9.72, and ammonia from 2.41 to 2.10.

Mr. Hallett continues as follows: I am pleased to report that the make of gas for January, 1890, will approximate the send out of January, 1889, notwithstanding the loss of the public lamps. The earnings have now reached such proportions, I believe the time has arrived when a substantial reduction of not less than 25 cents per 1,000 feet in the price of gas should be made. This is due the consumer, as the use of gas for lighting, fuel and mechanical purposes has become a public necessity. This reduction would still provide for all fixed charges, including 8 per cent. dividends amouting to $40,000 and leave a handsome margin for the extension of the plant. In 10 years the amount of gas made has doubled. The output was 41,071,000 in 1879, while in 1889 it was 82,582,000 cubic feet. The net profits for 1889 were $60,224. The earnings in 10 years were $629,676, including $32,000 earnings on the steam plant, from which were distributed $525,500 in dividends. While generous to ourselves the public is entitled to a share of the profits in a reduction in the price of this commodity, and it is wise for you to keep in mind that the rights of the consumers are fully protected as to the matter of the price and quality of the gas, and that if a reduction is not considered, advantage of the provisions of statute authorizing application to the Gas Commissioners for a reduction in prices may be made.

In presenting this report and laying down my charge as Treasurer, not being a candidate for re-election, I wish to submit to you, stockholders, a question, the definite settlement of which will facilitate the work of whoever we may elect as Treasurer. Has the Treasurer the privilege of appointing his own clerks and bookkeeper, the privilege to appoint carrying with it the right of removal? This question has already been raised in your Board of Directors and with what seemed to me a singular unanimity of opinion, they agree that the Treasurer has no such privilege or right. A brief statement of a few facts may serve to set forth the question clearly. On January 10, for what seemed to me imperative reasons, I discharged Ira B. Allen, who had been for many years in our service. The Directors claimed that in such discharge I had exceeded my authority and they requested that he be reinstated. I presented to them a written account of Mr. Allen's conduct, and set forth what I considered the privilege of the Treasurer to choose his own subordinates. Their opinion, however, remained unshaken. In the course of a few days Mr. Allen, in company with one of the Directors, called on me and offered full apology for his conduct, and out of consideration for him, as a personal matter, I received him back in his old place. I took him back not because I thought that in his discharge I had exceeded any authority vested in me as Treasurer, nor because in his discharge I had acted unjustly, for his apology showed the propriety and rightfulness of my action, but I reinstated him because he had been a faithful servant of the Company for many years, and after this unfortunate experience I thought that neither I nor the Company would have any reason to complain of his future.

The really important question (for Mr. Allen happens only to be the cause that brings it to the surface), as to whether the Treasurer has the right to appoint his own clerks, is left wholly undetermined. I quote from my statement to the Directors:

During 25 years, to my certain knowledge, the Directors, as a Board, have never been solicited or counseled in regard to the appointment of any employe of the Company; with the exception of a Superintendent, and in the case of Elis A. Hallett. To this the records attest. The only by-law bearing on appointments is article 5 which reads, "A President shall be chosen by the Directors who shall preside," etc., "all other officers or agents shall be appointed by the Directors, who shall prescribe their duties and fix their compensation," also, "the Directors shall elect a clerk who shall keep a record of the Board." The word "agents" as here used does not apply to mere clerks and employes; otherwise all laborers at the works could only be employed and discharged by the Directors. The fact that the Treasurer is responsible for all of the moneys received, keeps the accounts and is the party in charge of the finances of the Company, is required to give bonds for the faithful performance of the duties of his office, carries with it, by implication, the right to choose the bookkeepers and clerks who are to handle the money for which he and his bondsmen are liable, and make entries on the books for the accuracy of which he is responsible.

For the best interests of the Company and for the convenience of the Treasurer who may be elected and for our common interests as stockholders this question ought to be decided.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

In our issue for the 13th ult. it was stated that the trouble between the Lockport (N. Y.) Gas Light Company and its employees had been satisfactorily arranged. There are more Lockports than the one in this country, and unfortunately imperfect proof reading caused our item to be credited to the wrong place. As it would not do any particular good now to name the Lockport where the labor trouble did crop out, we will not so identify it. We can, however, in justice to the Lockport (N. Y.) Company, say that its principal employees are the same who have figured on its pay rolls for terms ranging from 15 to 30 years. Oh, no; it was not Lockport, N. Y.

In a letter recently received from an esteemed correspondent, the following tribute to the late Theobald Forstall is paid: "Mr. Forstall was a self-made man; he was fearless and honest. In all the years I have known him I never knew him to do anything to be ashamed of. Not a time-server, he knew his duty and performed it. He made many friends and very few foes. Though others might differ with him, yet they recognized his simple sincerity, and were bound to admire him for it. A busy man, yet he always had time to extend to others the courtesies of a gentleman. He imparted information to others very freely, and the student and uninitiated in gas works were never turned away unanswered when seeking information. I feel that a great man has fallen; quiet and unostentatious, he wielded an influence such as few men have. He was prompt, thorough and painstaking—a man of clear foresight and prompt judgment. He was a thorough believer in low prices for gas—$1 was his mark. He had been ailing for some time, and his trip to Europe last summer did not benefit him. On his return he grew rapidly worse, and we all said that death had marked him for his own. He did not like to have any reference made in his presence to his health. He declined to go south or elsewhere for his physical benefit, preferring to be with his family, to whom he was much attached. He was a kind husband and father, and a true friend. We all miss him greatly. I think the worry and cares of business had something to do with his early breaking down. It gives me great satisfaction to say that his son Alfred, who is in charge of the works of the Chicago Gas Light and Coke Company, is a most estimable young man, well qualified to keep the name of Forstall before the fraternity. I attended the funeral services, which were very simple; the ceremonies were carried out in accordance with the wishes of deceased. He desired that no one mourn for him.—J. S."

Something over a fortnight ago an explosion occurred in the purifying room of the Ottawa (Ont.) gas works, that caused damage to the amount of $500.

A meeting of representative citizens of the borough of Downington, Pa., was held a few days ago, the purpose for which the gathering was called being to agitate the availability and good policy of purchasing from the present owners the coal gas and water supply plants, the same to be thereafter operated on borough account. The sentiment of the gathering was strongly inclined to the affirmative of the proposition, and a committee of 5 (Messrs. Jos. H. Johnson, John McGraw, H. B. Sides, S. A. Bicking and D. M. Cox) was appointed to interview Mr. Frank Buck, President of the Company, as to what the proprietors would consider a fair price for the property. The President, who spoke for perhaps 85 per cent. of the stock, replied that the entire capital of the Company (meaning both gas and water divisions of the enterprise)

could be purchased for $75,000, and that that offer would remain open for 30 days. The citizens, on receiving the report of the committee, enlarged the latter to 15 members, with instructions to have the law examined, to determine whether or not it was in the province of the borough to raise money for such a purpose. The water works franchise of the Company is a valuable one, and the gas works portion of the enterprise would no doubt have been fairly profitable had even ordinary routine business management been devoted to its development.

AT the annual meeting of the Peoples Gas Light Company (Manchester, N. H.) the following officers were elected: President, John B. Varick; Vice President, Frank Dowst; Treasurer, W. L. Elkins, Jr.; Supt., Walter G. Africa; Directors, W. L. Elkins, Jas. F. Briggs, John B. Varick, Frank Dowst, Alonzo Elliott, Jas. A. Weston and W. L. Elkins, Jr.

THE Aurora (Ills.) Gas Company has been greatly enlarged and improved the past season. Over 7 miles of mains were put down, and plans for an extension similar to that of 1889 are being prepared for 1890. Mr. Copley says that the Company proposes to keep its pipe lines ahead of the times instead of behind them. This probably means that the mains are to be extended to what is known as the Downer Place Addition. The moneys expended on betterments in 1889 must certainly foot up $40,000.

THE Newport (R. I.) Gas Light Company will soon be in readiness to start up its auxiliary water gas plant. And this reminds us that if the annual meeting of the shareholders had to be postponed because of *la grippe*, the latter demon seems to have been unable to "hold down" the engineering and executive management. In any event, the reports of work accomplished for the last six months of 1889 show that over 4 per cent. had been earned on the capital stock, which rate of dividend was declared when the annual meeting was finally brought off.

THE Westinghouse Machine Company, of Pittsburgh, has received an order through its agency at Copenhagen, Denmark, for one of its famous automatic compound engines. The size selected is 14 and 24 by 14, and it will be set up at Kopparberg's Bergslaget, at Falur, near Stockholm, Sweden. Large numbers of these engines are now being shipped to foreign countries.

AT the annual meeting of the Belfast (Me.) Gas Company the following officers were elected: President, W. B. Swan; Clerk and Treasurer, John H. Quimby; Supt., A. K. Pierce; Directors, W. B. Swan, N. F. Houston, A. A. Howes, Chas. R. Hazeltine and John H. Quimby.

THE Fremont (O.) Electric Light and Power Company and the Fremont Gas, Steam and Plumbing Company have been consolidated. Mr. W. H. Ford has been chosen Secretary of the consolidated enterprise. Important plant improvements—both on the gas and electric light divisions—will be carried out forthwith. Mr. Fred. Fabing, former Superintendent of the gas works, will carry on the plumbing business in Fremont. We wish him the best of good fortune in this venture.

AT the annual meeting of the East Boston (Mass.) Gas Company the following Directors were chosen: Stephen H. Whidden, Thomas J. Whidden, William R. Sturtevant, John Thompson and Geo. L. Thorndike. The resignation of the Company's former Treasurer, Mr. Frederick Pease, was received and accepted.

THE Altoona (Pa.) Gas Company has made a demand on the authorities for damages in the sum of $177.80, for injuries occasioned the gas mains because of the falling in of the walls of the sewer drain now being laid through Ninth street, between Eighth and Eleventh avenues.

WE are in receipt of a couple of blotter calendars from the Kerr Murray Company, which we presume is the first issue of a series that shall be continued for the year. The calendar is for the current 30 days. It is a good idea.

WE are also in receipt of a very handsome annual calendar, published at the instance of Nathaniel Tufts, of Boston, Mass. It is a beautiful specimen of the engraver's art and the printer's skill. The etching on supporting sheet shows a typical mid-winter scene in New England—that is, it would be typical of the scene that should exist now, but which does not. The etching, however, has yet two chances of becoming emblematic of the winter season—the current month and December next.

THE Philadelphia *Inquirer*, of January 24th, said: "Financial circles found a choice morsel of gossip yesterday in the rumor that there had been consummated the sale of a controlling interest in the United Gas Improvement Company to a syndicate of English capitalists. To understand what such a sale means to the money market, it is necessary to know that the capital stock of the Company is $5,000,000, and that its gas plant possessions throughout the United States are almost of inestimable value. Practically it is a trust that seeks control of the gas interests of the country. The plants of city after city have been purchased, and many important patents in the gas manufacturing industry are owned by it. Based upon the knowledge that negotiations were pending for the purchase outright, or of a controlling interest in the Company, unknown investors have been buying all the stock of the Company coming out on the market. Within the past few days there has been a large increase in the market quotations of the stock. Its par value is $50, and yesterday 100 shares were eagerly bought in at 80, and 14 shares at 81 just as readily found a purchaser. This is against its closing price of 72½ in the early part of the month. The terms of the rumored syndicate purchase are shrouded in mystery; in fact, every effort is being made by those in interest to keep the matter strictly secret, but the shrewdest financiers give greatest credence to the most conservative statement of the hour, which is that $100 per share was offered for a controlling interest in the stock. A prominent officer and large stockholder of the Company, who asked that he be quoted anonymously, said last night: 'I will not deny that there have been negotiations with a number of English gentlemen who propose forming a syndicate and putting their capital in our Company, but nothing definite has been arrived at yet. I am not at liberty either to state the names of those who will compose the syndicate or of the terms of the negotiations. Everything in life is so uncertain that it is hard to say when any proposition will be consummated. I can say, though, that none of the negotiations so far considered contemplate a change in the methods of the Company or of officers. The way I account for the sudden rise in the stock is that its intrinsic value has met greater appreciation in the eyes of financiers. Not at any time during the past year, though I am a large holder, would I have accepted $100 per share for my stock. For a long time we have been looking for capital. We could use it advantageously; but I think the terms for a controlling interest would have to be more seductive than any sensible financier would offer. There is no desire to sell such an interest; we consider the works too valuable for that. I do not think the recent increase in stock at all artificial.'"

WE gather, from an independent source, and one quite likely to know something of what is going on in the above respect, that the Company has been successful in securing a long loan (at low interest rates) of considerable magnitude, the money to be used in increasing the number of leaseholds, or actual purchase of plants, to be operated by the Company.

MR. ROBERT F. MULLINS, lessee of the Fishkill and Matteawan (N.Y.) Gas Company, is endeavoring to secure a contract for the public lighting by gas of these villages. As an inducement he offers to supply gas to the lamps at a concession of 25 cents per thousand cubic feet from that now charged as the lowest net rate to ordinary consumers.

MR. MULLINS' proposition recalls to mind the fact that Superintendent W. H. Hayden has made many changes at Fishkill in the plant conditions respecting the gas supply. Hayden does not believe in manufacturing gas simply for the purpose of permitting an abnormally large percentage of the product to wander at its ill smelling will through the soil that covers the mains. (?)

AT the annual meeting of the Charlestown (Mass.) Gas Company the officers chosen were: President, J. F. Hunnewell; Clerk and Treasurer, G. B. Neal; Directors, J. F. Hunnewell, W. W. Wheildon, P. J. Stone, J. A. Sawtell, L. B. Hathan, C. F. F. Byam and C. R. Lawrence.

WE understand that an explosion that occurred on the works of the Sioux City (Ia.) Gas Light Company, on the night of Jan. 21, destroyed apparatus valued at $10,000.

THE electric light plant at Cleburne (Texas) has passed out of the receivers' hands, the property and franchises having been purchased by Max Elser, of Fort Worth and W. H. Gaston, of Dallas.

AT the annual meeting of the Warsaw (N. Y.) Gas Company the officers chosen were: President, S. D. Lewis; Vice-President, Augustus Frank; Secretary, J. B. Gates; Treasurer, B. F. Fargo; Directors, T. G. Hulett and L. W. Pettebone, of Niagara Falls, and S. D. Lewis, Augustus Frank, L. W. Thayer, Wm. Bristol, E. E. Forman, L. H. Humphrey and J. B. Gates, of Warsaw.

THE following leaves from the history of the Providence (R. I.) Gas Company will be read with interest:

Year.	Annual Output, Cu Ft.	Year.	Annual Output. Cu. Ft.
*1849.....	6,178,000	1860.....	58,143,000
1865.....	75,626,000	1870.....	132,310,000
1875.....	258,039,000	1880.....	280,833,400
1881.....	305,780,600	1882.....	310,026,500
1883.....	329,622,000	1884.....	344,773,000
1885.....	354,000,000	1886.....	361,149,000
1887.....	383,096,000	1888	429,720,000
1889.....	450,000,000		

The Company has a main mileage of 161, and 12,700 meters are in position. The unaccounted-for gas is returned for '89 at 8.7 per cent. The Company is notable in Providence financial history from the great number of shareholders, a statement of which is here given to prove the faith of the residents in the stability of the enterprise: There are in all 938 shareholders, among which the 50,000 shares are distributed. Of these 323 are men, holding 19,236 shares, 453 are women, holding 17,283 shares, 73 are trustees, holding 690 shares, 13 are guardians, holding 215 shares for their wards, and 41 are administrators and executors, holding 220 shares. Besides these 30 institutions have 4,124 shares. Three stockholders have 1,000 shares or over, 9 have from 500 to 1,000 shares, 123 have from 100 to 500 shares, 110 have from 50 to 100 shares, and 693 have less than 50 shares. There are 46,188 shares held by 833 shareholders in Rhode Island, and 3,812 shares are held by persons outside of the State. These latter can be traced to Massachusetts, New York, Connecticut, Maine, New Jersey, Vermont, California, Illinois, Ohio, New Hampshire, Pennsylvania and Virginia.

MR. A. B. RICHARDSON, of the Dover (Del.) Gas Company, writing under date of Jan. 22, on the subject of the Toraya process of gas making which is soon to be tried on a fairly large working scale at one of the branches of the Philadelphia municipal gas works, says: "The new Toraya process of making gas appears to be very similar to a process used here in Dover in 1862. The gas works in this town were built just before the war to manufacture gas from rosin, and during the war rosin went up to $60 per barrel. Then the following process was resorted to: Yellow pine wood was cut up into small blocks and soaked in oil until the wood was completely saturated. The blocks were then put into a charger, and the charger put into the retorts (of which there were six) and kept until all the gas was taken from the wood, which left the blocks transformed into very nice charcoal. The gas was then passed from the retorts to a scrubber filled with shavings, thence to a purifier filled with lime, thence to gasholder and street mains. As to the quality of the gas. If the blocks had taken up just the right quantity of oil the gas would be good; if not enough oil had been absorbed it would be poor; if too much oil it would smoke. In fact the ceilings in all the houses that burned the gas were well smoked, and, furthermore, the oil condensed in the pipes and fixtures, so that when the key was opened to light the gas the oil would come out in a spray before the gas would ignite. If the key was opened to light a burner that had not been used for 10 days, the gas would be so poor that it would not light until the freshly-made gas came to the burner. The consumers finally became so disgusted that they quit using the gas, consequently the works were shut down for a year. Then the firm of Richardson & Robbins bought the works and eventually fitted them up for making coal gas. The meters were worthless, the pyroligneous acid having destroyed all the diaphragms. Perhaps the Toraya Gas Company has overcome the difficulties."

AT the annual meeting of the Davenport (Ia.) Gas Company the following result was reached: President, J. J. Richardson; Secretary and Treasurer, Ross Woodmansee; Directors, G. H. Pendleton, O. T. Gaylord, R. Woodmansee, W. C. Putnam and J. J. Richardson.

MR. J. H. FARISH, Secretary and Treasurer of the St. Joseph (Mo.) Gas and Manufacturing Company writes: "It might interest the gas fraternity to know that our fuel gas schemers are not all dead. A few days ago Mr. W. S. Crosby, of Chicago, the chief promoter of the enterprise, despairing of the resurrection of his first bill, prepared another—a twin brother of its predeccssor, except that it called for a deposit of $15,000, to be made by him, and to be held by the City Comptroller, until the sum of $50,000 should have been expended by him, the said Crosby, in the erection of a fuel gas plant, when the deposit should be returned to him. At the same meeting of the City Council another water gas bill was introduced by one Charles McGuire, an obscure resident of this city, and undoubtedly a 'man of straw.' In his bill, Mr. McGuire, as a bait to our Councilmen, proposes to furnish what *light* and *heat* the city may wish in all of its public buildings, for *nothing*. It seems hard for a legitimate enterprise to live when so many people are willing to do business for nothing. However, both ordinances have been referred to a special committee of five, by whom the matter will soon be investigated."

*Gas first supplied.

THE authorities of St. Joseph would seem to be easily gulled were they to swallow the bait offered by either Crosby or McGuire; for certainly neither proposition contains anything likely to be of material benefit to the city. Should Crosby be successful he gets his $15,000 back. Quite likely he would expect to receive interest on it—and as for McGuire—well! when his employers had been successful in blackmailing the present St. Joseph Company, the latter could of course elect to work under its old charter. In the event of the McGuire coterie being o' liged to buy out the old company, they would undoubtedly elect to work under the old company charter, wherefore the city would not be a gainer in either event. The rulers of St. Joseph might better encourage and protect the old company, whose course towards the public has always been of the liberal order.

IN proof of this latter claim we beg to submit the following evidence, which comes to us in the shape of an official announcement from Secretary Farish. The concession took effect on the first inst., and its terms, as explained by Mr. Farish are: "Conforming to our usual custom of reducing the price of gas from time to time as our increasing consumption would justify, we have reduced the price of gas to $1.50 per 1,000 cubic feet to all customers using from 1,000 to 100,000 cubic feet monthly. Quantities in excess of this are to be supplied at $1.37½, and gas used for fuel or power purposes is to be sold at $1.25."

WE think our readers will agree with us that these are cheap rates. Further, the article of gas that the St. Joseph Company distributes—when used for fuel purposes—at the rate of $1.25 per 1,000 will be found at least twice as effective as the article which Crosby *proposes* to distribute at a slightly lower rate. We would also like to add in conclusion, that the Company's ability to supply gas at these rates is a striking testimonial to the ability of its engineer—Mr. K. M. Mitchell.

A LINE from Mr. John Lorenz, Supt. of the Johnstown and Gloversville (N. Y.) Gas Company, informs us that oil of a good quality has been struck in a well that was being drilled for gas about one mile south of Johnstown. Naturally, great excitement prevails in the district over the discovery; but as yet nothing definite has been learned as to the yield, work on the well-hole having been temporarily suspended.

MR. H. A. NORTON, No. 4 Central street, Boston, Mass., succeeds Messrs. Sprague & Sons as agents for the fireclay goods from the works of James Gardner, Jr., Lockport Station, Pa. The Messrs. Sprague resigned the agency because of the pressure of other business. We congratulate Mr. Gardner on his good fortune in securing so capable a successor to the Messrs. Sprague—who are, as they ought to be, in high favor with the Eastern fraternity—since Mr. Norton is the worthy son of his father—Nashua's Honorable gas man.

AT the annual meeting of the Wallingford (Conn.) Gas Company the following officers were elected: President and Treasurer, Col. W. G Leavenworth; Secretary, Judge L. M. Hubbard; Directors, L. M. Hubbard, W. S. Leavenworth, G. W. Hull, B. A. Treat and Mrs. W. C. McClellan.

AT the annual meeting of the Van Wert (Ohio) Gas Light Company the following officers were elected: President, A. C. Glenn; Vice-President, D. Shepard; Secretary and Superintendent, J. M. Tryon; Treasurer, G. C. Glenn. It was decided to increase the capital stock to $37,500 from $25,000. The business of the Company is increasing steadily, and the outlook for the year is of the most encouraging sort.

THE meter manufacturing firm of Bell & Jones will erect the new 14 ft. by 14 ft. station meter for the Philadelphia municipal gas works station at Point Breeze. The contract was awarded on Jan. 28th.

"SOME of the residents of Chelsea, Mass., are preparing a petition for the consideration of the State Board of Gas and Electric Light Commissioners in which it is sought to secure a cheaper gas rate for the city. There is evidently some malice behind this movement that can probably be traced to those not widely separated from others connected with the project for establishing a fuel gas plant in Chelsea.—HADDAM,"

AT the annual meeting of the Newport (R. I.) Gas Light Company, Mr. Henry Bull was re-elected President, Mr. Thomas A. Lawton was chosen Treasurer, and Mr. Andrew K. Quinn was named as Secretary. The Directors are Messrs. Henry Bull, Jas. C. Swan, Thos. A. Lawton, Philip Rider, Robt. S. Case, W. H. Fludder and A. K. Quinn. The latter takes the place of the late Mr. John A. C. Stacy.

The Cambridge (Mass.) Gas Light Company has reduced its net selling rate to $1.60 per 1,000 cubic feet.

NEW YORK and Rochester capitalists hold an option to purchase the Batavia (N. Y.) gas works, the option to last until February 20th. It is likely that a sale will result.

ACCORDING to the minutes of a recent session of the Committee on Lamps of the Boston Board of Aldermen, several residents on Commonwealth avenue have petitioned for the restoration of gas lamps on that avenue. Messrs. C. P. Curtis, C. Woodburn and E. I. Brown appeared before the Committee and asserted that the electric lights were of but little use, particularly in the summer time, as the shade trees in the park prevented the light from extending to the sidewalks. They *wanted the gas lights restored*, but did *not want the electric lights to be removed*. The petition was taken under advisement.

AT the annual meeting of the Manchester (N. H.) Gas Light Company the following officers were chosen: President, Hon. Moody Currier; Clerk, Lucien B. Clough; Treasurer, Walter M. Parker; Directors, Hons. Moody Currier, Nathan Parker, Daniel Clark, G. Byron Chandler and Mr. Chas. Warren.

PETER J. KLINGES has brought suit in the Philadelphia Court of Common Pleas (No. 3) on behalf of Henry Sauer, who asks for $5,000 damages for injuries occasioned by an explosion of gas on December 28, 1889. Complainant had for five years been a tenant of the premises 2313 East Thompson street, where he carried on the business of a baker. He claims that owing to the wearing out, by oxidation, of the service pipes from the gas main, gas escaped and accumulated in the vault under the house in such volume that an explosion occurred. Sauer was severely burned, and he further asserts that his business was ruined because his house was so badly damaged that he was compelled to remove.

PATRICK HOYT, a well-known character in the employ of the Citizens Gas Light Company, of Newark, N. J., died about a fortnight ago. He was known among his fellows as "the gas house poet."

THE annual meeting of the stockholders of the Brookline (Mass.) Gas Light Company was held at the office of the Company in Brookline, on Wednesday, January 22, President Robert Amory in the chair. The report of the Clerk and Treasurer, Francis W. Lawrence, was a very satisfactory one. President Amory, in presenting the Directors' report, stated that the loss by leakage had been reduced to 10.95 per cent., although the number of consumers per mile of main has not correspondingly increased. The taxes are a little more than the salaries of the Company's executive officers. The profits of the Company from electric street lights were barely 4 per cent. last year on the cost of installation. There is every reason to believe that the cost of a municipal plant to the taxpayers would be very much larger than it is to a private corporation of a Gas and Electric Light Company combined under one management, and with this understanding of the case, the Directors had agreed to furnish electric lights for Brighton at 40 cents per night for 5 years. This will yield small profit, but will obviate the necessity of enlarging the Company's gas plant, the demands upon which are now almost up to the limit. President Amory reported the sale of the stock of the Suburban Light and Power Company to a Roxbury syndicate. The following named Directors were chosen by a vote of 3,354 shares each, the entire number thrown: Robert Amory, Wm. H. Hill, Francis W. Lawrence (Clerk and Treasurer), F. H. Odiorne, McPherson Lemoyne. Organization was effected with the unanimous choice of Mr. Amory as President.

Recent Patent Issues.

The following list of recent patents relating to the gas interests is specially reported by Franklin H. Hough, solicitor of American and foreign patents, 925 F street, N. W., Washington, D. C.

ISSUE OF JANUARY 7, 1890.

419,098. Gas, Apparatus for Making Oil. T. and S. Alexander and R. Patterson, Kirkintillock, Scotland.
418,807. Gas Blow Pipe. D. M. Monroe, Baltimore, Md.
418,846. Gas Burner for Stoves. J. H. Keyser, New York, N. Y.
418,821. Gas Engine. J. D. Smith, Philadelphia, Pa.
418,711. Gas, Manufacture of. W. Rogers, Pittsburg, Pa.

ISSUE OF JANUARY 14, 1890.

419,183. Gas Burner. G. K. Cooke, Jamaica, N. Y.
419,444. Gas Fuel Burner. C. L. Holden, Indianapolis, Ind.
419,350. Gas Washing Apparatus. M. A. Piedra, Schriever, La.

ISSUE OF JANUARY 21, 1890.

419,845. Gas and Liquid Holder. J. Flannery, New York, N. Y.
419,651. Gas Burner. W. F. Folmer, New York, N. Y.
419,652. Gas Burner. W. F. Folmer, New York, N. Y.
419,784. Gas Burner. W. S. Mead, New York, N. Y.
419,806. Gas Engine. C. W. Weiss, Brooklyn, N. Y.

ISSUE OF JANUARY 28, 1890.

420,193. Gas and Liquid Holder. J. Flannery, New York, N. Y.
420,169. Gas Engines, Gas Regulator and Equalizer for. W. C. Rossney, Cambridge, Mass.
420,241. Gas Motor or Engine. P. J. McMahon.
420,412. Gas Regulator. J. H. Lehman, Philadelphia, Pa.

Correspondence

[The JOURNAL is not responsible for the opinions expressed by correspondents.]

The Lighting Situation at Fort Scott, Kas.

FORT SCOTT CITY GAS COMPANY,
FORT SCOTT, Kas., January 27th, 1890.

To the Editor AMERICAN GAS LIGHT JOURNAL:

A word about the present condition of the lighting interests in Fort Scott, Kas.

Having seen nothing in the JOURNAL in regard to the present *raid* upon the lighting industries of the city, I think it may interest the JOURNAL readers, and the gas fraternity generally, to learn what is going on in this portion of Kansas. The total failure to develop and distribute natural gas at this place three years ago left the parties badly stranded, and several later attempts to form combinations by which the old natural gas pipe lines were to be made use of for an opposition illuminating company all resulted in failure, until last summer, when, in the throes and agony of despair, the parties visited New York and picked up one W. H. Frost, at the time in the employ of the "Consolidated Gas Company," and induced him to put his money, or that of others, into a scheme with the idea of wiping out, at one fell stroke, all of the legitimately invested gas and electric light interests in this city.

A reorganization of the old Company was effected by electing Mr. Frost President and General Manager, and Messrs. Geo. G. Porter and C. W. Isbell, of the Smith & Sayre Mfg. Company, New York, named in the Directory, together with others here, who had been hurt in the failure of the natural gas scheme.

Work was commenced on an expensive "coal gas plant," and *flaming advertisements* inserted in the daily papers that gas would be furnished for both *heating* and *lighting* purposes at 50 cents per 1,000 cubic feet, and that it would be as cheap as coal *for fuel*.

Gas was to be furnished by the 1st of January, 1890, and the city was thoroughly canvassed for consumers. Service pipes and meter connections were to be put in free of charge, and people were led to believe that they were to have this gas for fuel as cheap or cheaper than coal. Their building is still incomplete, but work is progressing on it, and I presume that in a few months they will be ready for business.

It is possible that Eastern capital may find it very profitable to invest in opposition gas companies in Kansas for the purpose of selling gas at 50 cents per 1,000 cubic feet, but the average gas manager will be pleased to learn by what method it can be accomplished. If it has ever been demonstrated in the East that such a thing can be done, why does not New York keep her *educated experts* at home, building gas works and selling cheap gas? This question we would be pleased to see answered.

The Fort Scott City Gas Company, that has supplied the town with gas for over 20 years, extending its works from time to time to meet the wants of the people, laid out in 1887 and 1888 $30,000 for improvements and extensions, and owns as complete a manufacturing and distributing system as can be found in any city of the size of Fort Scott, either East or West. To sum up, it has a capacity of over 200,000 feet per day, and nearly 15 miles of substantial cast iron mains, the price for gas ranging from $1.25 to $2 per 1,000.

The electric light plant established over 4 years ago with a capital invested said to be nearly $100,000, is furnishing incandescent lights at from 25 to 75 cents each per month, against which the old Gas Company has thus far held its own.

The fact of two Gas Companies and one arc and incandescent electric light plant engaged in a triangular fight, in a city of the size of Fort Scott, does not look promising for large dividends in the near future. The old Companies, backed by home capital, will maintain their position at all hazard, and somebody will suffer.

L. K. SCOFIELD, President Ft. Scott City Gas Co.

THE AMERICAN GAS LIGHT JOURNAL

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PROPRIETORS.

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Germany.—B. WESTERMANN & CO., of New York.

MONDAY, FEBRUARY 3, 1890.

The Market for Gas Securities.

Consolidated sold up to 97¾ during the week, but rather free offerings towards the close drove the sale back to 96½, at which figure opening sales were made to-day (Friday, January 31). On Wednesday Muller sold at auction 33 shares Consolidated at 97¾. Equitable is steady at 119 to 122, and Mutual is at 107½ bid. Brooklyn shares are inclined to higher prices, old Brooklyn being quoted at 108 to 110, while there is every likelihood that it will soon score a still further advance. Metropolitan is at 93 to 96, and Peoples is bid for at 77. In out of town shares we note that Cincinnati gas is at 201½ bid. Baltimore Consolidated lost some of the recent advance, having sold during the week at 52¾. There is no good reason, however, for the slump. A block of 841 shares Jersey City gas was disposed of at auction this week, at 186. It seems to us the stock is cheap at that figure.

Rumor is very busy with the intentions of those in control of the United Gas Improvement Company, shares in which are advancing rapidly. The Company propeses, as we understand it, to largely increase its operations, and in furtherance of this proposition we believe it has been determined to increase the capital stock from five to ten millions of dollars.

Bay State gas is at 23 to 25, and Laclede Common is offered at 17. Chicago Trust shares are quoted at 47⅞ bid. The reports submitted by 21 Eastern Companies at the annual meetings of the shareholders show net average earnings on the capital stocks represented of 9.4 per cent.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,

16 WALL ST., NEW YORK CITY.

FEBRUARY 3.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share. ☜

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	96½	—
Central	500,000	50	—	—
" Scrip	220,000	—	—	—
Equitable	4,000,000	100	119	122
" Bonds	1,000,000	—	113	115
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	116	118
Mutual	3,500,000	100	107½	—
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	—	—
" Bonds	150,000	—	—	100
Standard Gas Co—				
Common Stock	5,000,000	100	—	—
Preferred	5,000,000	100	—	—
Yonkers		50	112	—
Richmond Co., S. I.	346,000	50	60	70
" Bonds	20,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	108	110
Citizens	1,200,000	20	68	70
" S. F. Bonds	320,000	1000	100	103
Fulton Municipal	3,000,000	100	122	125
" Bonds	300,000		100	105
Peoples	1,000,000	10	77	—
" Bonds (5's)	368,000	—	100	—
" " (6's)	94,000	—	100	—
Metropolitan	1,000,000	100	93	96
Nassau	1,000,000	25	112	—
" Ctfs	700,000	1000	100	—
Williamsburgh	1,000,000	50	118	122
" Bonds	1,000,000	—	108	112
Out of Town Gas Companies.				
Boston United Gas Co.—				
1st Series S.F. Trust	7,000,000	1000	—	92½
2d " " "	3,000,000	1000	71	72
Bay State Gas Co.—				
Stock	5,000,000	50	23	25
Income Bonds	2,000,000	1000	—	—
Buffalo Mutual, N. Y.	750,000	100	90	95
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	155	160
" " Bonds	45,000	—	—	—
Chicago Gas Trust	25,000,000	100	47⅞	—
Chicago Gas Light & Coke Co.—				
G't'd Gold Bonds	7,650,000	1000	93½	93¾
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1000	97	—
People's Gas and Coke Co., Chicago—				
1st Mortgage	2,100,000	1000	—	99
2d "	2,500,000	1000	—	97
Consumers Gas Light Co., Jersey City	2,000,000	100	—	—
Bonds	600,000	1000	—	—
Cincinnati G. & C. Co.	6,000,000	100	201	203
Consumers Toronto	1,000,000	50	190	200
Central, S. F., Cal.			80	90
Capital, Sacramento, Cal			58	
Consolidated, Balt.	11,000,000	100	52½	53
" Bonds	6,400,000		107	107½
Hartford, Conn	750,000	25	102	108
Jersey City	750,000	20	186	190
Laclede Gas Light Co., St. Louis, Mo.—				
Common Stock	7,500,000	100	—	17
Preferred "	2,500,000	100	—	—
Bonds	9,034,400	1000	86	—
Louisville, Ky	2,570,000	50	125	130
Little Falls, N. Y.	50,000	100	—	100
" Bonds	25,000	—	100	103
Montreal, Canada	2,000,000	100	200	208
Memphis (Tenn.) Gas	750,000	100	48	51
" Bonds	240,000	100	103	—
New Haven, Conn		25	200	—
Oakland, Cal.			35	35½
Peoples, Jersey City		—	60	61
" " Bonds			—	—
Paterson, N. J.		25	99	102
Rochester, N. Y.		50	99	100
Syracuse, N. Y.	500,000	25	—	—
San Francisco Gas Co.			60	60½
San Francisco, Cal.	10,000,000	100	59¾	60
Washington, D. C.	2,000,000	20	200	208
Wilmington, Del.		50	88	90

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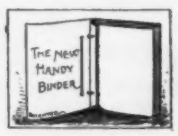

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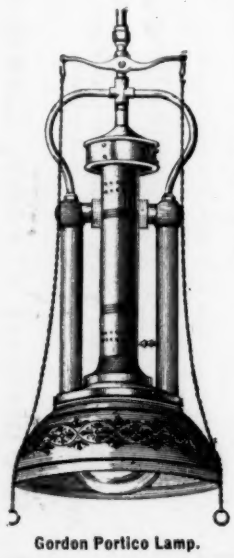

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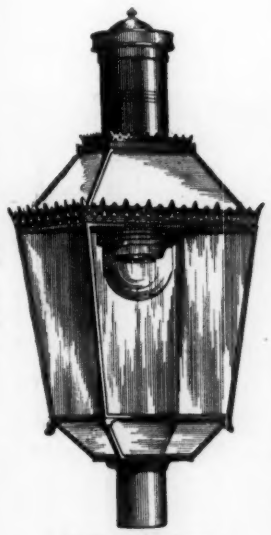

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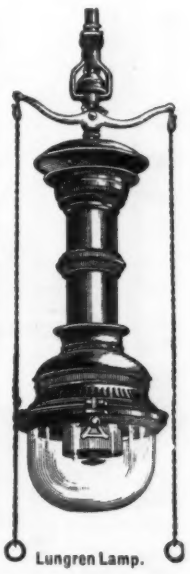

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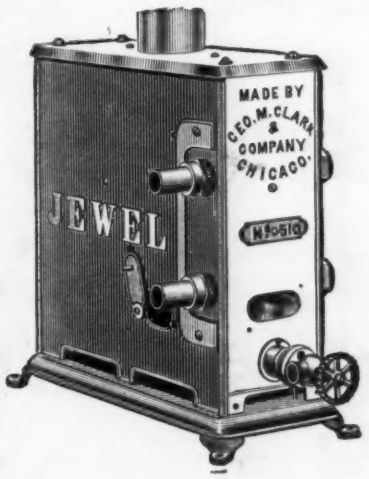

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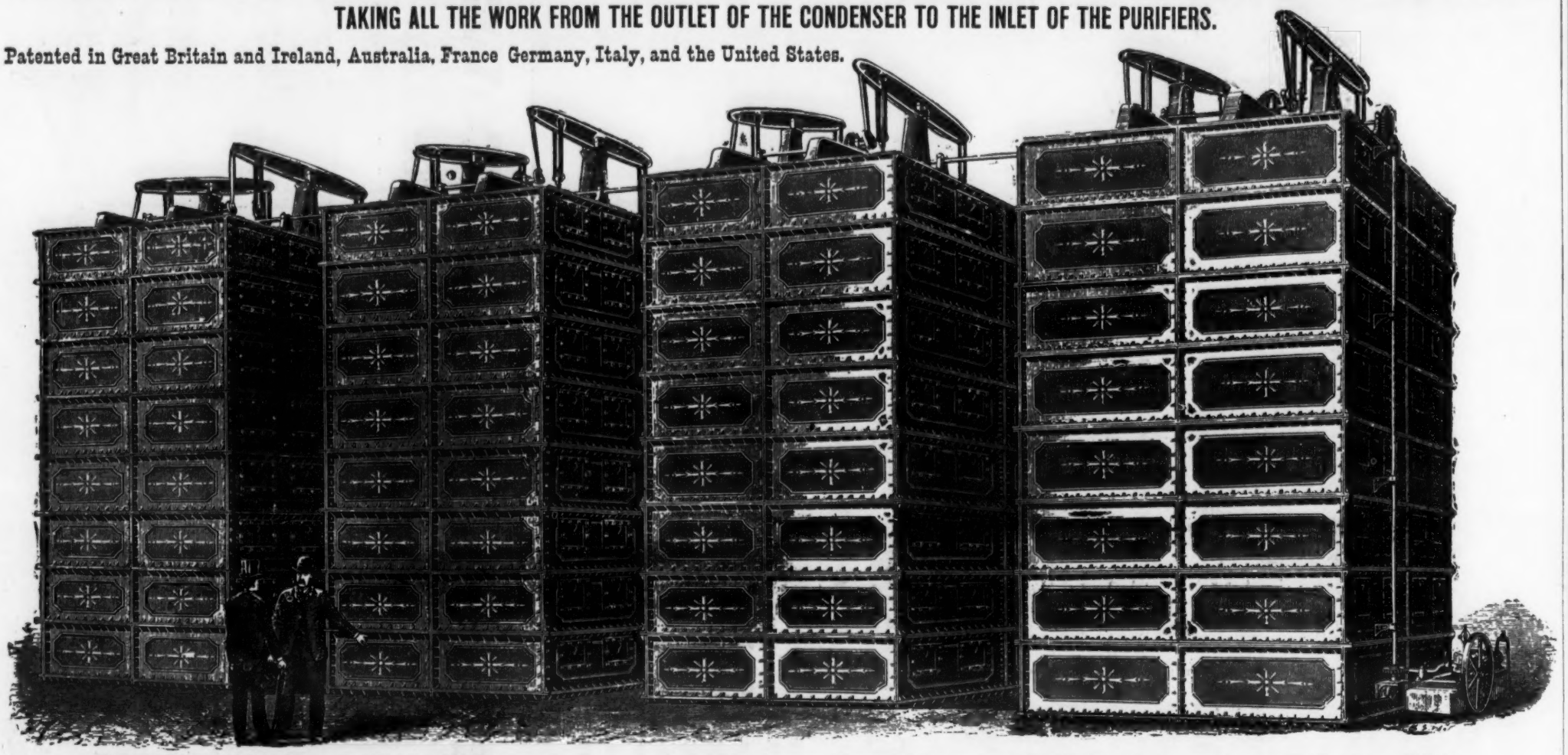

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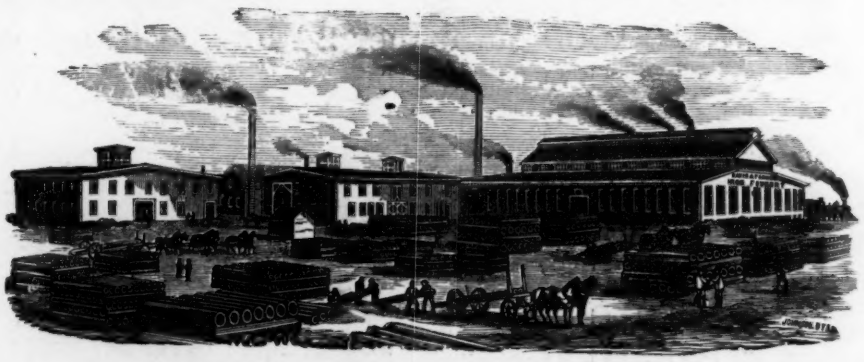

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A very general demand exists, in both large and small Gas Works, for an apparatus that will be absolutely efficient in the removal of the tar which passes the hydraulic main and condenser. Many attempts have been made to accomplish this, but, I believe, without success, until the introduction, five years ago, in England, of the C. & W. Walker Patent Tar and Carbonic Acid Extractor. During these years this apparatus has been adopted by many of the most prominent Engineers, not only in England, but also on the Continent of Europe and in other parts of the world. It is only necessary to give here a partial list in order to convince any intelligent American Gas Engineer that this machine must have succeeded fully in accomplishing the desired results.

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No. 5,	"	"	750,000	"	"	"	7	"	"	"	"	
No. 6,	"	"	1,000,000	"	"	"	8	"	"	"	"	
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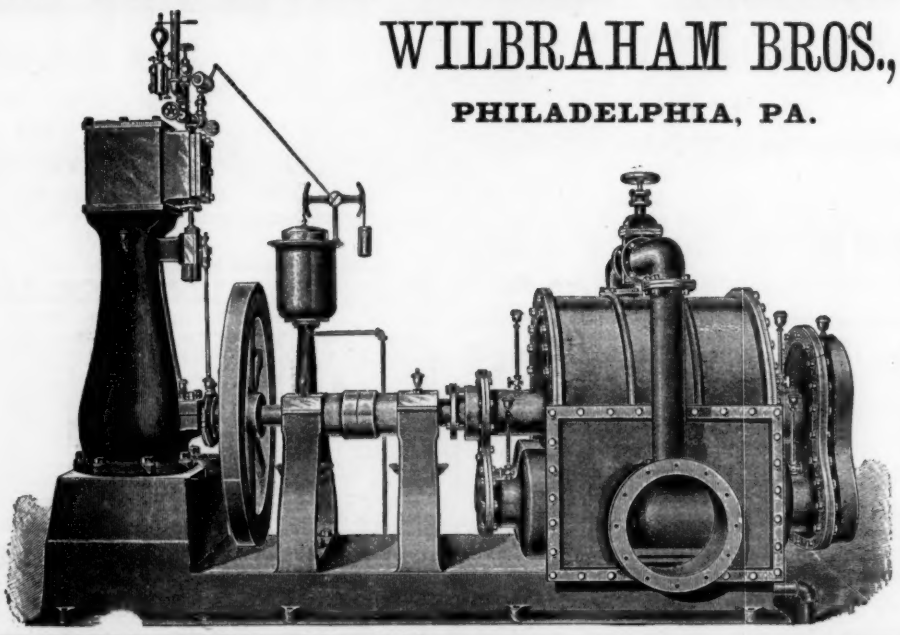

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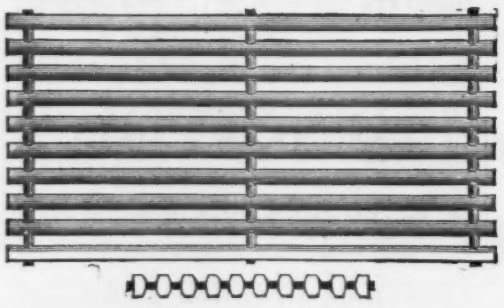

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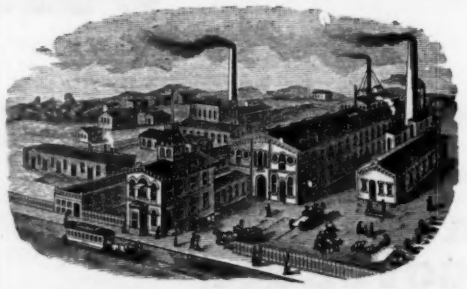

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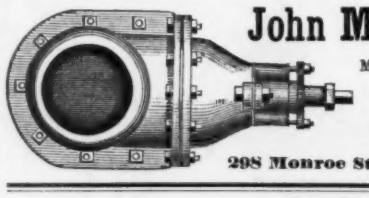

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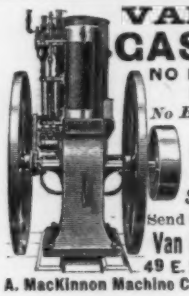

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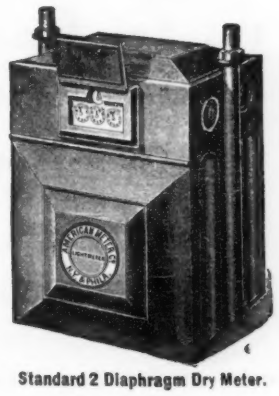

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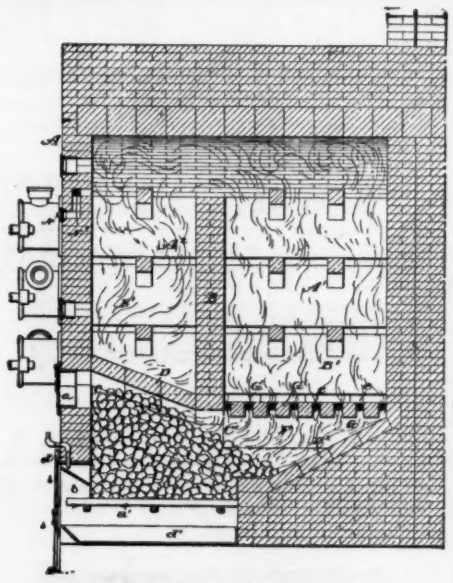

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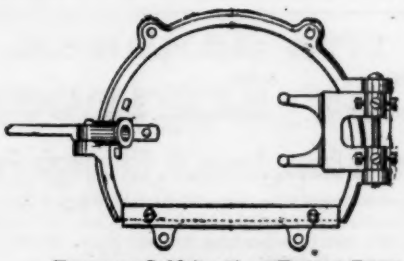

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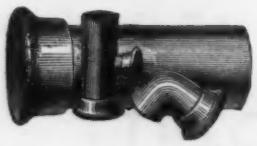

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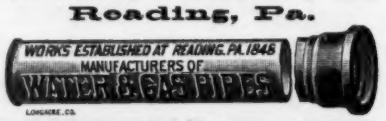

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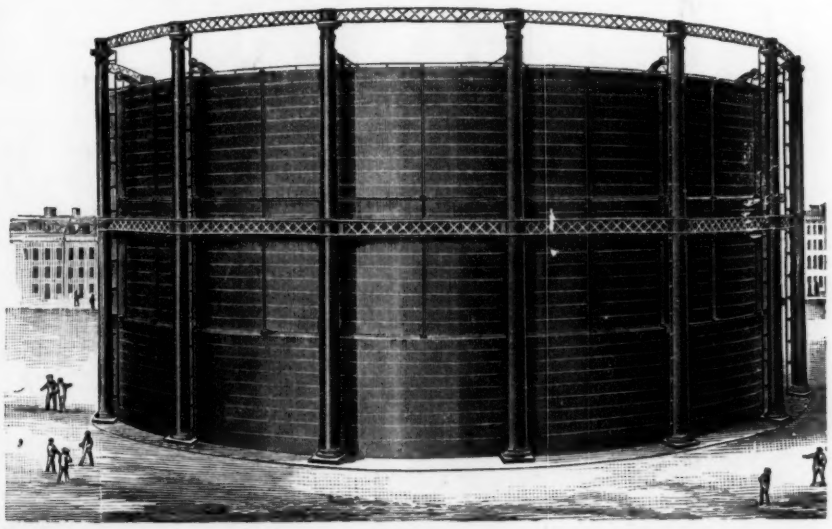

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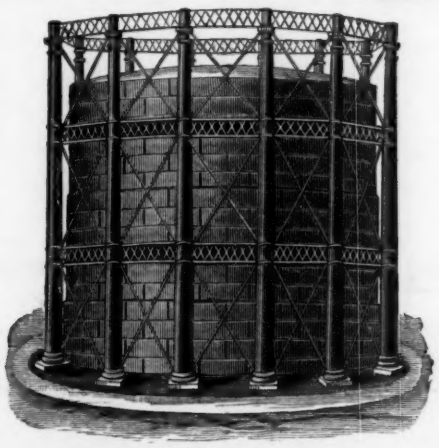

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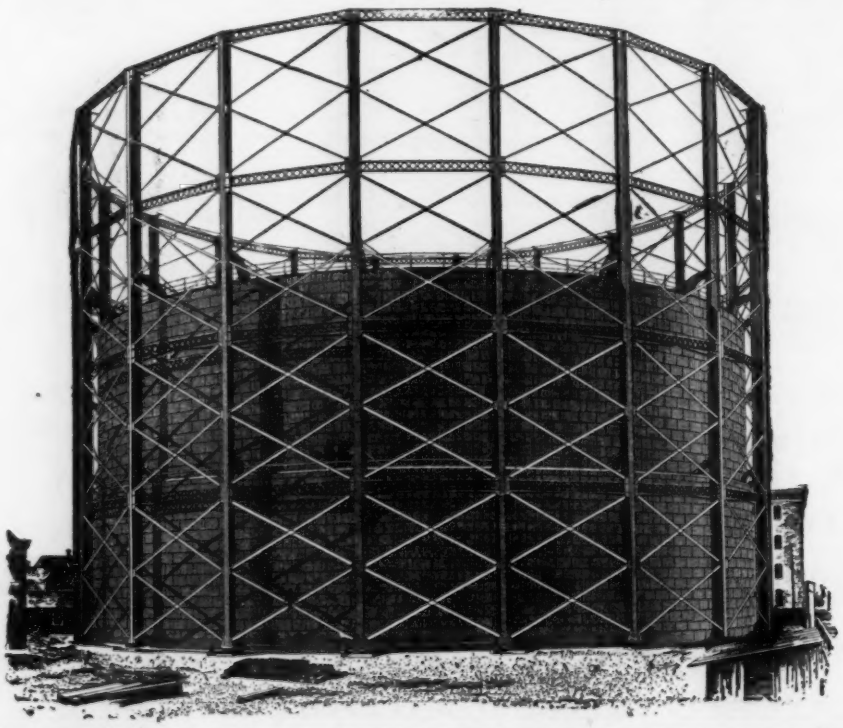

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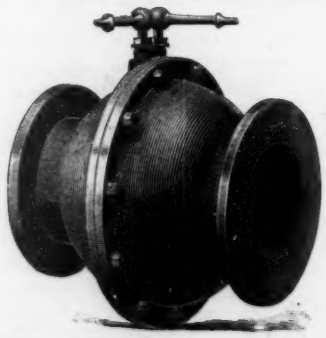

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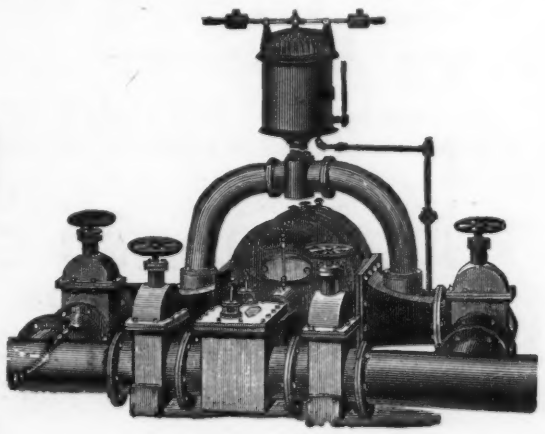

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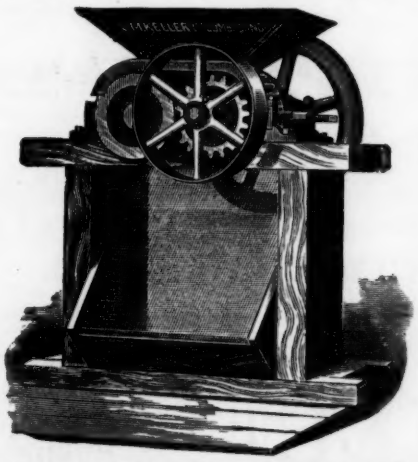

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SIZE.

Stove.	Oven.	Roaster.	Top.	Length over Extension Shelves,
37 in. high.	12 in. high.	12 in. high.	24 in. long.	36 in.
20 in. wide.	17½ in. wide.	18 in. wide.	21 in. wide.	
	12 in. deep.	13 in. deep.		

This Stove has four burners on top, and double oven burner.

Consumption of gas with all burners in use, 42 feet per hour, at 1 inch pressure.

The top is made in sections, so that a greater variety of cooking utensils may be used. By lifting out the covers and crosspieces and putting in a suitable forked ring, which is sent with each stove, a wash boiler or other large utensil may be set over two burners. Our **No. 87 GRIDDLE** also fits in the same position. The roasting oven is provided with a cast-iron door.

All Fittings are Nickel-Plated.

GAS COOKING STOVE, No. 7 B.

SIZE.

Stove.	Oven.	Roaster.	Top.	Length over Extension Shelves,
31 in. high.	9½ in. high.	10 in. high.	21 in. long.	32 in.
17 in. wide.	14½ in. wide.	15 in. wide.	16 in. wide.	
	12 in. deep.	13 in. deep.		

This Stove has three boiling burners in the Top or Hot Plate, and one single oven burner.

This cut represents our New Style Cooking Stove. As will be seen, it has an ornamented cast-iron Base and Front, and extension shelves. The Oven Burner, which is atmospheric (unless otherwise ordered), is of an entirely new and improved pattern (patent). The ovens are of greater capacity than those of the old style. The Top, in conjunction with the Outlet Pipe, is designed to carry off all the products of combustion, if desired, but they are also supplied with a loose ring which converts it into an ordinary open top stove.

The consumption of this Stove is 35 cubic feet per hour at 1 inch pressure, with all Burners in use.

All Fittings are Nickel-Plated.

"RADIANT" BOILING STOVE, WITH REGENERATIVE BURNER.

Size, 6¼ inches diameter, 3 inches high. Consumption, 4 feet per hour at 1 in. pressure.

HOT PLATE, No. 111.

Size, 36 in. long, 12 in. wide, with three double burners, 6 taps.

Consumption, with all burners in use, 36 cubic feet per hour, with 1 in. pressure.

¾ in. supply pipe should be used where the pressure is 1 in. or over.